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L'auteur présente quatre nomogrammes pour la détermination de (1) la rétention générale des matières sèches (Brix) dans le sucre commercial, (2), la production des mélasses finales par le poids de canne, (3) la rétention % des matières sèches (Brix) dans les dernières cuites, et (4) le volume de la dernière masse cuite par le poids de canne. On fait des calculs comme exemples et dispose les résultats en tables.

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La comparaison entre le dioxyde de soufre et l'aldéhyde formique comme bacteriostats dans la diffusion. 1-ère partie. J. F. T. OLDFIELD, J. V. DUTTON, D. GRIERSON, R. K. HEANEY et H. J. TEAGUE. *p.* 296–298

On discute l'emploi du dioxyde de soufre (en forme gaseuse) comme alternatif à l'aldéhyde formique pour le contrôle du pH dans la diffusion, et présente des résultats d'essais laboratoires et dans la sucrerie sous la forme de graphiques qui démontrent les effets de SO_2 et de l'aldéhyde formique sur le changement du pH dans des échantillons de jus incubé.

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La solubilité du saccharose dans l'eau à des températures dans l'intervalle de 144–185°C. J. FERNÁNDEZ B. *p.* 299–300

La précision des données de la solubilité du saccharose de BENRATH pour les températures entre 100 et 144°C est evaluée en employant une équation dérivée par SCHRÖDER. On montre que les valeurs se trouvent le long d'une ligne étroite, que l'on emploie pour le calcul de la solubilité du saccharose a des températures entre 144 et 185°C par des intervalles de 5°. La formule est donnée pour le calcul à cettes températures plus hautes.

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* * *

Vergleich von Schwefeldioxyd und Formaldehyd als Bakteriostate in der Saftgewinnung. Teil 1. J. F. T. OLDFIELD, J. V. DUTTON, D. GRIERSON, R. K. HEANEY und H. J. TEAGUE. *S.* 296–298

Die Verfasser diskutieren die Anwendung con Schwefeldioxydgas statt Formaldehyds für die pH-Kontrolle in der Saftgewinnung, und geben einige Ergebnisse von Fabrik- und Laborversuchen in der Form von Diagrammen, welche die Wirkungen von SO_2 und Formaldehyd auf pH-Anderungen in inkubierten Saftproben zeigen.

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Lösbarkeit von Saccharose in Wasser bei Temperaturen im Bereich von 144–185°C. J. FERNÁNDEZ B. *S.* 299–300

Die Genauigkeit von BENRATH s Lösbarkeitdaten für Saccharose bei Temperaturen im Bereich von 100–144°C wird an Hand einer von SCHRÖDER abgeleiteten Gleichung abgeschätzt. Die Werte liegen auf einer Gerade, die für die Berechnung von Saccharose-Lösbarkeit bei Temperaturen im Bereich von 144–185°C je 5° angewandt wird. Die Formel für die Berechnung bei diesen höheren Temperaturen wird gegeben.

Cálculo de las templas finales en la fabricación de azúcar. H. PONS. *Pág.* 291–296

Se presentan cuatro nomografías para determinar: (1) la retención general de sólidos Brix en azúcar comercial, (2) producción de melaza final por unidad de peso de caña, (3) sólidos Brix % retención en templas finales, y (4) volumen de la templa final por unidad de peso de caña. Cálculos ejemplares se hacen y las resultas se presentan en forma tabular.

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Comparación de dióxido de azufre y formalina como bacteriostates en difusión. Parte I. J. F. T. OLDFIELD, J. V. DUTTON, D. GRIERSON, R. K. HEANEY y H. J. TEAGUE. *Pág.* 296–298

Se discute el uso de dióxido de azufre en forma gaseosa como alternativa de formalina para control de pH en difusión y resultas de pruebas en la fabrica y el laboratorio se presentan en la forma de gráficas que demuestran los efectos de SO_2 y HCHO sobre la variación de pH de muestras de jugo incubadadas.

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Solubilidad de sacarosa en agua en el alcance 144–185°C. J. FERNÁNDEZ B. *Pág.* 299–300

La confianza de los dados de BENRATH de solubilidad de sacarosa en el alcance 100–144°C se evalua por medio de un ecuación desarrollado por SCHRÖDER. Los valores se encuentran á lo largo de una linea recta, que se usa para calcular la solubilidad de sacarosa en el alcance de temperatura 144–185°C. Se presenta la fórmula para el cálculo en este alcance alto.

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Notes & Comments

International Sugar Conference.

While the industry was waiting hopefully for resumption of the International Sugar Conference in Geneva on the 23rd September, there came a sudden shock when Dr. RAUL PREBISCH, Secretary-General of the United Nations Conference on Trade and Development, received a personal letter from a high Washington official on the 3rd September saying that the United States did not think the "technical conditions" were ready for the conference to be resumed. Postponement was requested, although the US was ready for informal consultations to continue.

No official reason for the request was given and the belief has been expressed that the Administration is concerned that successful conclusion of an Agreement which would benefit Cuba economically, among the other sugar exporters, might provide some basis for domestic political attacks in the Presidential election campaign.

A number of countries, including Australia, Brazil and South Africa are reported to have told Dr. PREBISCH that to postpone the conference would be a major waste of their work, time and money, and that it would be fatal for the achievement of an agreement if the issues already negotiated were to be scrapped. Consequently Dr. PREBISCH decided to let the countries involved decide for themselves whether to resume the conference or not; he sent cables to all those participating, and requested a reply by the 9th September, in time for the meeting of the UN Consultative Committee on Sugar. These were received and the Committee decided that the conference would reconvene, as originally planned, on the 23rd September and would last until the 18th October.

The US will not be attending the conference but will probably be represented by an observer; however, American interests are hardly affected by an International Sugar Agreement. The US neither sells nor buys on the world free market and, apart from her general economic influence, it is not necessary for the functioning of an Agreement to have the US as a signatory.

In the weeks prior to the American request for a postponement there had been a general decline in sugar prices. This could be expected from pressure to sell sugar which might have to be held as stocks by the holders when a new Agreement came into force. This would be likely, in order to reduce availabilities to the world market as a measure to improve prices. The request brought a sharp fall in futures prices and the London Daily Price dropped by £0·50 per ton to £16·50 per long ton c.i.f. UK, but recovered the next day. With the confirmation of the reconvening of the Conference, futures prices also recovered, although the low levels which still apply emphasize the need for conclusion of an Agreement which could restore prosperity to the industry.

* * *

Tongaat Sugar Co. Ltd. 50th Anniversary.

The specially-produced and illustrated Annual Report of the Tongaat Sugar Co. Ltd. for 1968 celebrates the 50th Anniversary of the Company, although it succeeded a Company registered in Liverpool, and the first sugar estate was set up in Tongaati in 1854. From a cluster of grass and reed huts in 1918, the village of Tongaati has become a model of town planning in Africa, with high standards of housing and amenities for African, Indian and European communities. Mule-wagon haulage of cane has been replaced successively by locomotive tramlines and, since 1956, heavy-duty road vehicles. Large dams and extensive overhead irrigation schemes have been built, and cane production brought to an increasingly high level by adoption of chemical fertilizers and new cane varieties, etc. Cane lands have been acquired for expansion of production, and since the beginning of this decade a policy of diversification has been adopted.

Thus Moreland Molasses Company has been formed for manufacture of molasses-based animal feeds, while Moreland Technical and Engineering Consultants Ltd. was formed to provide design and consulting services, an outstanding example of its achievements being the bulk sugar terminal at Durban.

Other divisions are concerned with manufacture of fabrics, agency and merchandizing services, agricultural consultancy, land development, electrical engineering, building, quarrying, etc., and the Company has a one-third share in the Consortium which controls Hulett's Sugar Corporation Ltd.

It is fitting that, in their Golden Jubilee year, the Company should have set new records for cane harvested and sugar produced, the total cane crop being 1,946,041 tons, of which Company fields contributed 707,000 tons, and sugar output 204,181 tons. The full benefit of the record cane crop was not realized, unfortunately, as the average sucrose showed a marked drop, resulting in a higher cane: sugar ratio than the previous year (9·53 *vs.* 8·68), when 196,172 tons were produced from 1,702,458 tons of cane crushed.

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World sugar production, 1967/68.

F. O. Licht K.G. recently published their third estimate of world sugar production in 1967/68[1]. Most of the figures will be final, and West European estimates are almost unchanged from the 2nd estimate published in the spring[2]. Adjustments to East European figures have brought the total estimate for Europe, and also world beet sugar production, higher by about 130,000 metric tons, raw value.

Estimates for the cane crops, ending later in the year, have been subject to greater revision, that for Cuba being raised by 200,000 tons and that for Brazil and the US cane sugar industry by 100,000 tons each. Puerto Rico's crop is set 68,000 lower, and the Dominican Republic's by 113,000 tons. Peru is expected to produce 70,000 tons less than expected earlier, and Colombia 30,000 tons more. The Mozambique estimate is 40,000 tons higher, while the Rhodesian figure is cut from 200,000 to 140,000 tons, and that for Congo (Brazzaville) is raised by 34,000 tons. The Indian estimate is up by 60,000 tons, while that for the Philippines is 117,000 tons lower and that for Australia 37,000 tons lower. The net results of all the changes is a rise in the total cane sugar production estimate of only 25,000 tons, and in world production of 152,000 tons, to 67,083,185 tons, or 2·73% higher than the corresponding figure for 1966/67.

* * *

US raw sugar prices.

The huge difference between current free market prices for raw sugar of about 1·5 cents per pound f.o.b. and stowed and the domestic price is emphasized by a survey recently published by Lamborn & Co. Inc.[3] who anticipate that, because of the inflationary trend in the United States, raw sugar prices will go as high as 8 cents per pound, duty paid at New York, in 1969. Raw sugar prices have increased from the average price of 6·75 cents per pound in 1965 to the average for the first seven months of this year of 7·45 cents per pound. The spot price in August was 7·60 cents per pound.

In their comments, Lamborn & Co. point out the clear indications of the ever-increasing cost of living, whether it be in food generally, or all those other products the farmers buy, which costs affect the Parity Index.

The Parity Index is of importance because it is an influence with the Department of Agriculture in establishing the US over-all quota for sugar. For some time the price of domestic raw sugar and the Parity Index for sugar have been practically identical.

It is the opinion of Lamborn that during the next year the percentage of increase in the Parity Index will be greater than the average increase in the Index for the past three years. For the past three years the average increase was 3%, while the increase in the next year could, in their opinion, go to 4 or 5%.

* * *

European sugar beet area, 1968.

At the beginning of August, F. O. Licht K.G. published a third estimate of sugar beet areas in Europe for 1968[4]. The total has been reduced by about 178,000 hectares from the previous estimate[5], to 6,736,000 ha. Only minor changes were made for most countries, the change in the total being almost wholly the result of a decrease in the USSR figure from 3·8 to 3·6 million hectares.

With reference to the European beet area, C. Czarnikow Ltd[6]. wrote recently: "The market has been very conscious of the reports of an increased area and good growing conditions in the EEC and there are fears that the Common Market arrangements may lead to substantial quantities of sugar being exported at very low prices. Taking Europe as a whole, however, it seems unlikely that production will reach last season's level. The area is lower than in either of the two previous seasons while it would be unrealistic to anticipate that the general excellent conditions which prevailed at harvest time in 1967 and which led to such a high output last year will be repeated. Some countries in East and South-East Europe have suffered from drought and yields well below the average must be anticipated from these regions."

* * *

Errata.—In our Note and Comment concerning International Sugar Agreement prospects last month we referred to the prices payable in the European Common Market for sugar up to 105% of consumption and between 105% and 125%. Unfortunately we gave the prices to be paid for beet of 16% sugar content; the prices for white sugar are, of course, $223.50 and $212.30 per ton, respectively.

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[1] *International Sugar Rpt.*, 1968, **100**, (22), 1–5.
[2] See *I.S.J.*, 1968, **70**, 129.
[3] *Lamborn Sugar Bull.*, 9th August 1968.
[4] *International Sugar Rpt.*, 1968, **100**, (21), 1–2.
[5] *I.S.J.*, 1968, **70**, 162.
[6] *Sugar Review*, 1968, (878), 147.

Calculation of final strikes in sugar manufacture

By HORACIO PONS

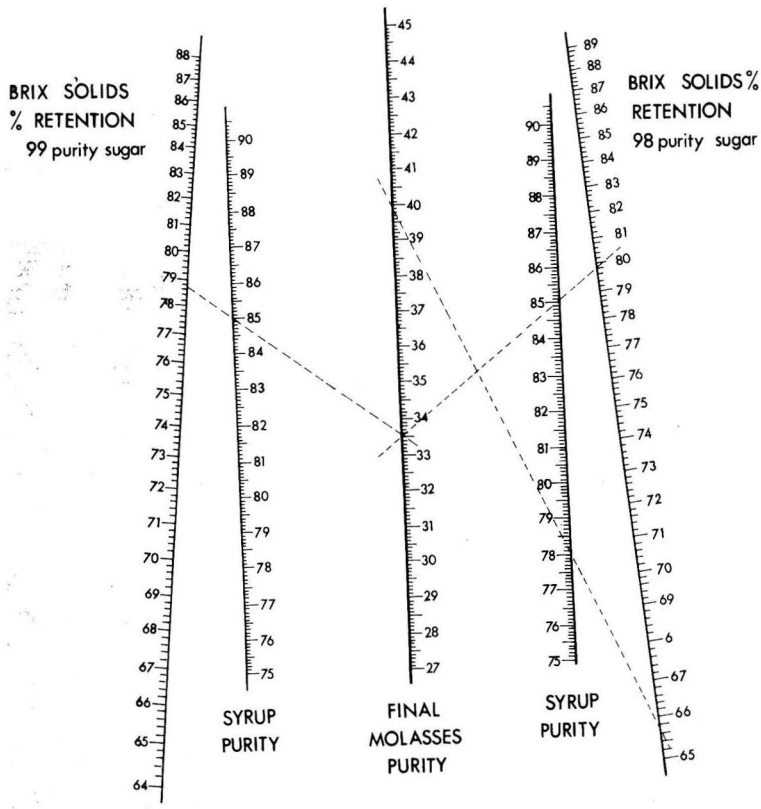
FOR rapid approximate calculation of the volume of final massecuite obtained in the manufacture of raw sugar, it is suggested that use be made of four nomographs included in this article. These take into consideration all the variables of appreciable practical importance, and for more than five years results obtained with them in different sugar factories have been shown to be in good agreement with reality notwithstanding the fact that they are based on Brix solids and apparent purities.

Such calculations by graphical means give us rapidly a sufficiently close idea of the capacity actually available in the plant for boiling and purging final strikes, and it is very convenient to know this, especially when an appreciable fall occurs in cane quality.

In addition to letting us know to what point we must limit mill throughput to avoid overloading the boiling house and even greater inconvenience, we are able to attempt modifications in the process which will give us some additional margin of operative capacity, observing what the result will be by means of the nomographs.

In not a few instances, in difficult times, experiments occur to superintendents of fabrication who attempt modifications without making the corresponding calculations owing to the fact that at the time it is not convenient to delay the work by making direct calculations; this sometimes gives results contrary to those expected.

For technologists who do not use nomographs frequently and are not familiar with them, we should point out that the most common error is not to take a second or two to observe, for each scale, in which direction the values increase and what is the value of each division of the scale. The straight line may be obtained with a ruler or setsquare, but it is more practical to use a thin transparent sheet which provides a true straight line.

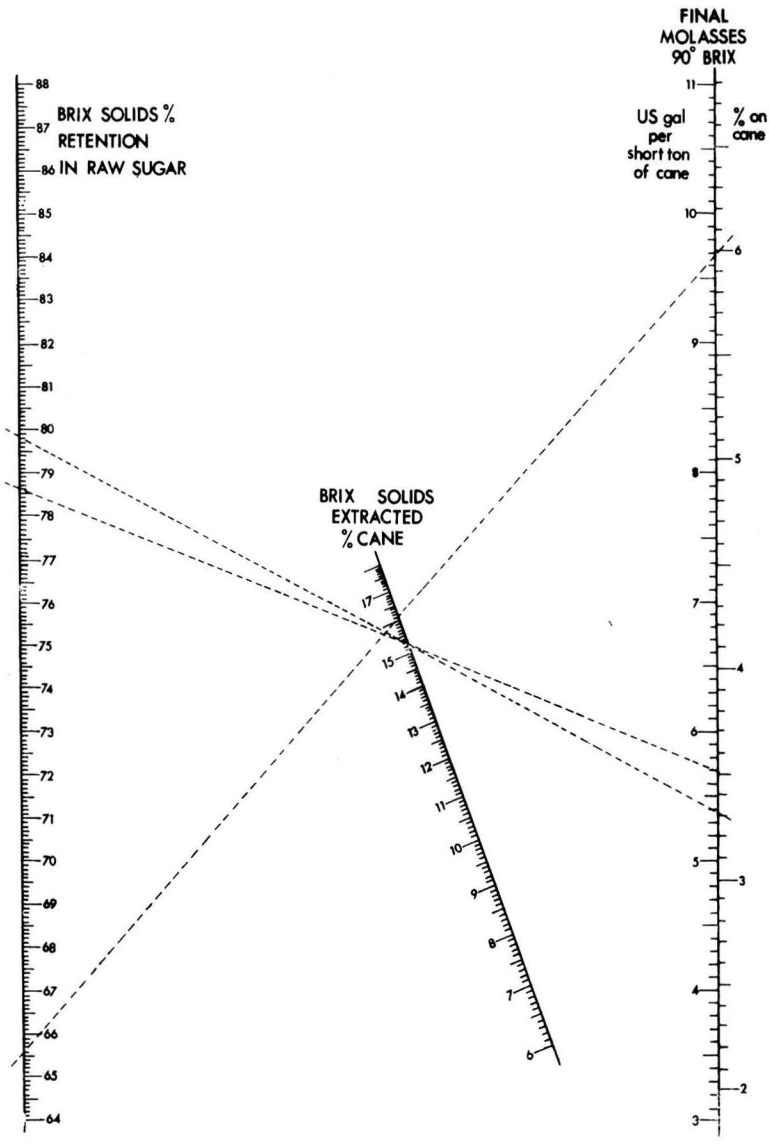


Nomograph No. 1. Brix solids % general retention in raw sugars.

Nomograph No. 1 is to find the General Retention of Brix Solids in Commercial Sugar. This refers to the proportion of Brix solids entering as syrup which leaves as commercial sugar. We have chosen purities of 98 and 99 for the sugar, since sugars destined for the international market are generally worked at 98 purity while it is common practice to make sugar of 99 purity for sending to refineries on the home market. For a case where the sugar purity is 98·5 we may average the results. It is not practically significant to make interpolations for intermediate sugar purities as the variation in the final results will be very small.

This nomograph has a central scale corresponding to the purities of final molasses which is used with the other two scales on the right when making sugar of 98 purity and with the two on the left when making 99 purity sugar. For example, for a syrup purity of 85·0, final molasses purity of 33·5 and sugar purity of 98·0, we extend an imaginary line from 33·5 on the central scale through 85·0 on the syrup purity scale to the right and meet the General Retention scale on the extreme right at 79·8. With the same syrup and final molasses purities, making sugar of 99 purity, the line extends from the same point on the central scale towards the syrup purity on the left and meets the General Retention scale on the extreme left to give an answer of 78·6.

Nomograph No. 2. The data used in this are the General Retention, obtained as above, and the Brix Solids Extracted % Cane. The latter is the product of the Mixed Juice Extraction and the Mixed Juice Brix, divided by 100; although this figure does not appear directly in laboratory reports, it is of great importance since all the flow of materials in the factory is proportional to this quantity; it is very useful to observe its variations during different seasons in order to specify plant capacities.



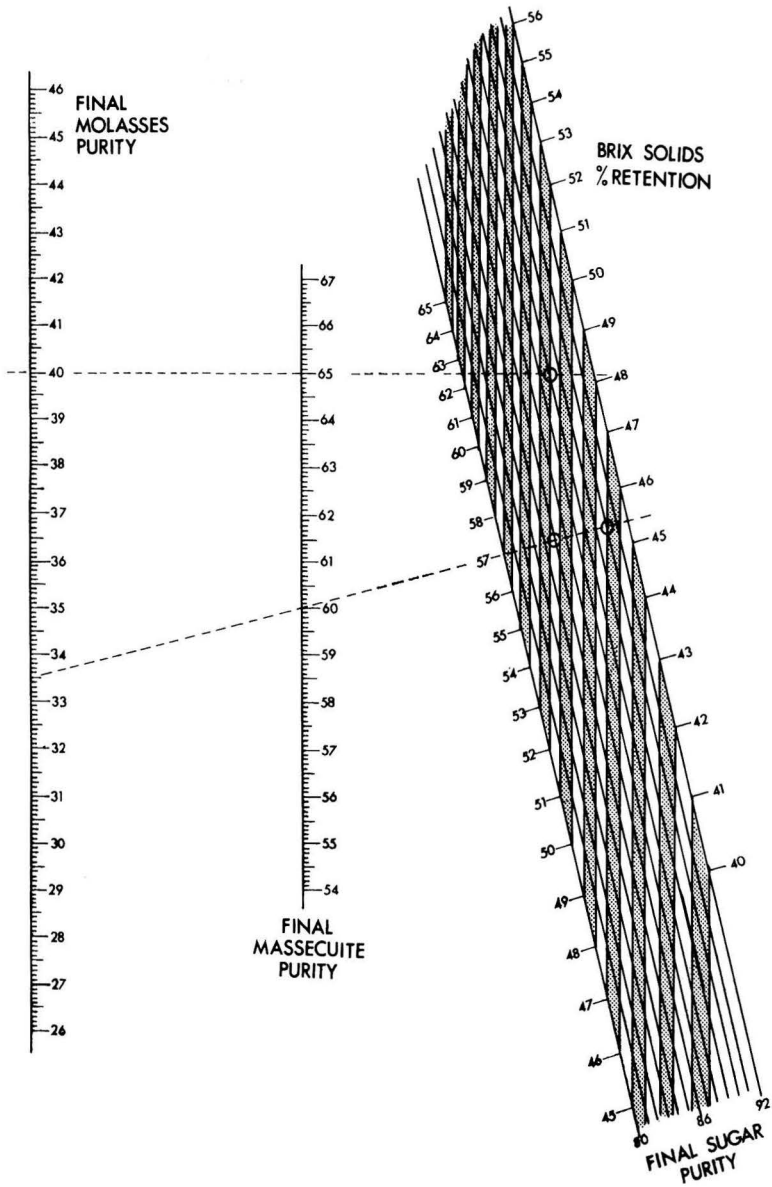
Nomograph No. 2. Final molasses production on weight of cane.

Let us look at an example: with a mixed juice extraction of 95·0 and mixed juice Brix of 16·0 we have a figure of 15·2 Brix solids extracted % cane to use in the nomograph. From the General Retention scale on the left, the corresponding line passes through the inclined central scale to meet on the right hand scale the appropriate value for final molasses (90° Bx) % cane. Thus for Brix solids extraction of 15·2% cane, a general retention of 79·8 corresponds to a final molasses figure at 90° Bx of 3·3% on cane, while a retention of 78·6 corresponds to 3·5% on cane. On the other side of the scale to the right are included equivalent values in US gallons of 90°Bx final molasses per short ton of cane, which gives an idea of the volumetric production.

Nomograph No. 3. With this we determine the Brix Solids Retention in Final Strikes,

using the relationships between four variables. For example, with a final massecuite of 60·0 purity, final sugar of 85 purity and final molasses, as already assumed, of 33·5 purity, the line passes from the left-hand final molasses purity scale through the central massecuite purity scale and will cut a series of parallel inclined lines on the right which represent the purities of final sugar from 80 to 92. At the point where the line meets that corresponding to a final sugar of 85 purity (the purities are indicated below the lines), we find the % retention, observing its position with respect to the lines, also parallel to each other but in this case vertical, which are labelled at their ends with the retention. In the example, the point falls between the vertical lines corresponding to 51 and 52 retention, approximately in the middle, so that we say that the % retention of these strikes is 51·5. An estimated accuracy of 0·5% in the graph is sufficient for these calculations.

Despite the complication apparently presented by



Nomograph No. 3. Brix solids % retention in final strikes.

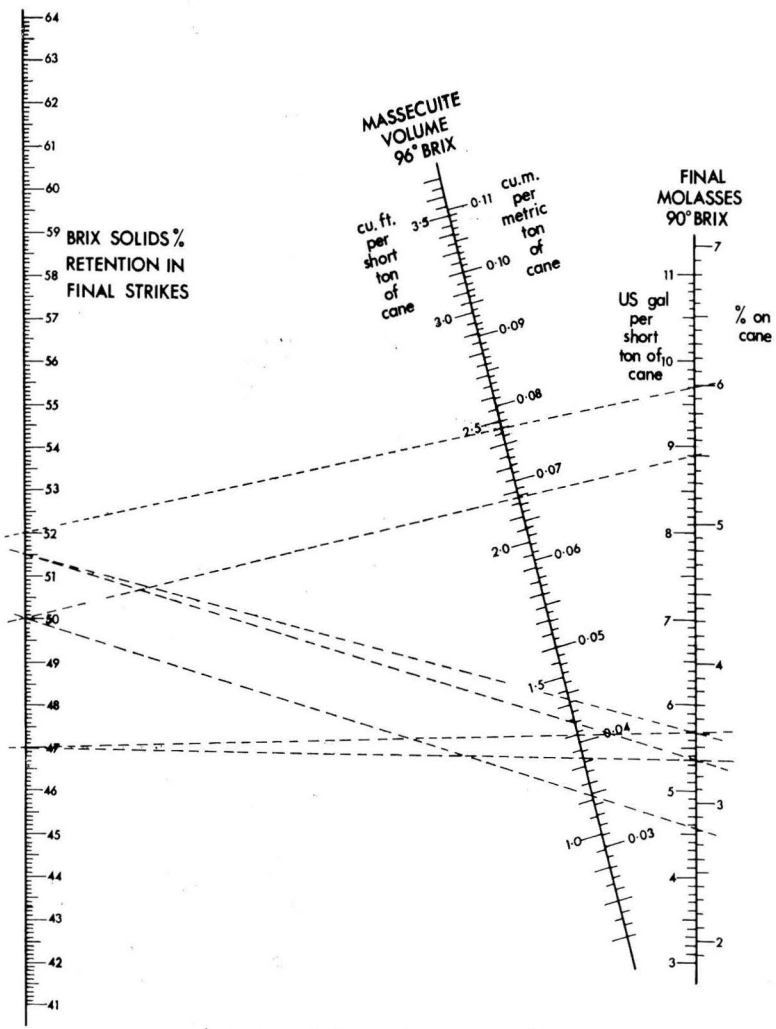
having to use four variables in the nomograph, it is preferable to using a different graph for each final sugar purity with which we might be concerned, or to take an average of these as a constant, since this figure has a rather large influence on the results.

We have found it useful to shade or colour alternate strips between the lines corresponding to the percentages of retention so as to distinguish them better and to avoid having to use two rulers at the same time.

Let us see what will be the retention if the final sugar should be of 90 purity, with the same purities as above for massecuite and molasses. The same line as before continues and cuts that corresponding to 90 final sugar purity on the vertical line which corresponds to 47% Retention, which will be the new answer.

These nomographs with four variables permit a large number of calculations to be made with different data in a very short time and, if a note is made of the answers, we can avoid having to repeat them each time the same set of data occurs.

Nomograph No. 4. The results obtained with the previous two nomographs are the data for this one. In the left hand scale we have the Retention in the Final Strike and in that on the right the Final Molasses (90°Bx) % Cane or US gallons of 90°Bx molasses per short ton of cane. A line passing from one to the other meets, on the inclined scale in the centre, the volume of final massecuite on weight of cane. On one side of the scale this is given in cubic feet of final massecuite per short ton of cane and on the other the equivalents in cubic metres of massecuite per metric ton. Massecuite of 96°Bx is taken as the standard. For the volume of massecuite as well as of molasses, the standard assumed temperature is taken as 20°C. Volumetric expansion through temperature, air and gases must be estimated by the sugar technologist in each case if he is concerned with this.



Nomograph No. 4. Final massecuite volume on weight of cane.

The results of the foregoing examples are tabulated in Table I; for the four cases syrup purity of 85·0 and final molasses purity of 33·5 have been assumed.

We can see that there is not a great difference between the results of these examples, owing to our maintaining constant syrup and final molasses purities and Brix solids extractions % cane. The volume of massecuite will be directly proportional to variations in the Brix solids extracted % cane.

Let us now look at two examples with different syrup purities,

Table I

—Nomograph 1—		—Nomograph 2—		—Nomograph 3—		Nomograph 4
Sugar purity	*General Retention*	*Brix solids Extracted*	*Final molasses % Cane*	*Final sugar purity*	*Final strike Retention*	*Final massecuite volume (cu.ft./ton)*
98·0	79·8	15·2	3·30	85·0	51·5	1·34
98·0	79·8	15·2	3·30	90·0	47·0	1·22
99·0	78·6	15·2	3·50	85·0	51·5	1·42
99·0	78·6	15·2	3·50	90·0	47·0	1·30

Table II

—Nomograph No. 1—		Nomograph No. 2	Nomograph No. 3	Nomograph No. 4
Syrup purity	*General Retention*	*Final molasses of 90°Bx % Cane*	*Final strike retention*	*Final massecuite volume (cu.ft./ton cane)*
78·0	68·3	5·50	50·0	2·17
88·0	84·1	2·75	50·0	1·11

leaving the remaining data constant. We will assume that the Brix solids extracted % cane are 16·1 and that in both cases commercial sugar of 89·0 purity is produced and final molasses of 35·0 purity. For the final strike we will assume 60·0 massecuite purity and sugar of 85·0 purity. The results, obtained in the manner indicated above are given in Table II.

Differences in syrup purity as large as given in the table can be found in the same factory from one season to another and even in the same season, especially in sugar areas where well ripened cane can be milled.

The volume of final massecuite may be modified sufficiently by the system of final strike working. If in the foregoing example of syrup of 78·0 purity we make the final massecuite of 65 purity and, in order to obtain easier purging, we alter Brix, purging temperature or some other factor to this end; supposing that the final molasses purity rises to 40·0 and the resultant final sugar purity is 88·0, we find from the nomographs that: the general retention falls to 65·6 (Nomograph 1), 90°Bx final molasses % cane rises to 6·0 (Nomograph 2), final strike retention increases to 52·0 (Nomograph 3) and the volume of final massecuite increases to 2·47 cu.ft. per short ton of cane (Nomograph 4).

From these results we would decide whether it is really convenient to make these changes, that is to say if the milling capacity can be improved by this means, or whether, on the contrary, the increase in final massecuite volume to be processed in the pans and centrifugals is harmful to us. At the same time we could analyse the economic aspects of this result by calculation of difference between pol lost in final molasses in both cases. Calculation with the nomographs, varying the data at will, permits us to choose the most suitable method of working in preparation of the strikes.

From Nomograph No. 2 we already have the quantity of 90°Bx final molasses % cane (Mol_f). Pol loss in final molasses % cane (L_f) can be calculated using the following formula:

$$L_f = \frac{P_f}{100} \times Mol_f \times 0{\cdot}9$$

where P_f = purity of final molasses. With the data of the last three examples we see that the pol loss in final molasses % cane is as follows:

Table III

Syrup purity	*Final molasses purity*	*90°Bx final molasses % cane*	*Pol in final molasses % cane*
78·0	36·0	5·50	1·73
88·0	35·0	2·75	0·87
78·0	40·0	6·00	2·16

Summarizing, (i) we use six data, variations of which can influence the results significantly; these are: Brix solids extracted % cane and the apparent purities of syrup, commercial sugar, final molasses, final massecuite and final sugar.

(ii) By placing only the ruler or other device for producing a straight line appropriately on each of the four nomographs we are able to read on the appropriate scale the results which can lead us to a knowledge of important data such as the corresponding final molasses % cane and volume of final massecuite.

(iii) Direct calculations take some time to carry out, require memorization of the calculating procedure and the consulting of tables for which, when there is more need for carrying them out, there is no time available. Facility with the use of the nomographs, however, is acquired rapidly and results are obtained with them with sufficient ease that we can make the necessary calculations any time there is a call to do so to choose the working procedure most suitable for the economy of the factory.

We should acknowledge that the syrup to which we have made reference is presumed not to be altered by mixing with other materials. In the case when final sugar is melted and returned to the clarified juice we cannot take the resultant syrup purity for these calculations. A factor can be applied to the mixed juice purity which is used instead; this factor which is generally 1·020–1·025 must be determined practically when the syrup purity is not altered.

All the above refers to calculations in sugar factories which do not produce refined sugar. But we can also calculate the volume of final massecuite when all or part of the raw sugar produced is refined or even if raw sugar from other sources is melted. This we find by adding to the volume of 90°Bx final molasses in US gallons per short ton of cane, obtained by Nomo-

graph No. 2, that which corresponds to the refined sugar, in proportion to the cane milled.

This can be made clearer with an example; a factory-refinery crushes 4000 tons of cane per day and, refining part of its production, obtains 300 tons of refined sugar per day. If, in the refinery calculations, we have 12 US gal of 90°Bx final molasses per ton of refined sugar, we have to add $\frac{300 \times 12}{4000}$ = 0·9 US gal/ton to the figure we obtain from Nomograph No. 2 for the factory without refining. If this figure is 5·5 gallons, we must consider 6·4 as the initial figure to use with Nomograph No. 4 to find the volume of final massecuite.

If we assume that the final strike retention is 50·5, with Nomograph No. 4 we find that, for a case without a refinery, we have 1·35 cu.ft. of final massecuite per ton of cane. On the other hand, in the case where the above proportion of the output is refined, we have, from Nomograph No. 4, 6·4 gal of final molasses which corresponds to 1·57 cu.ft. of final massecuite, that is to say 5400 cu.ft. in the first case and 6280 in the second. The broken lines drawn on the nomographs represent the examples referred to in this paper.

Comparison of sulphur dioxide and formaldehyde as bacteriostats in diffusion

By J. F. T. OLDFIELD, J. V. DUTTON, D. GRIERSON, R. K. HEANEY and H. J. TEAGUE
(British Sugar Corporation Ltd. Research Laboratories, Colney, Norwich)

Paper presented to the 19th Tech. Conf., British Sugar Corporation Ltd., 1968

PART I

Introduction

THERMOPHILIC bacteria in continuous diffusers militate against good factory performance in two known ways:—

(1) by destroying sucrose to yield acid[1] and

(2) by reducing nitrate to nitrite which, in white sugar factories using sulphitation, leads to imidodisulphonate formation[2,3].

The activity of thermophilic bacteria can be suppressed by raising the temperature or by the addition of chemical bacteriostats.

In Britain, the usual factory practice is to employ a moderately high diffusion temperature of about 68–73°C, in combination with formaldehyde, injected either continuously or by shock dosing. Complete suppression of the bacteria by heat is hardly practicable since a temperature of at least 80°C would be necessary[4] and at such a temperature losses of pulp marc would be excessive.

Formaldehyde is employed because it is effective, persistent, a liquid and therefore easy to apply, and also relatively cheap. It has the additional advantage of being degraded during liming to yield harmless products[5].

Recently, several factories of Raffinerie Tirlemontoise S.A. have employed sulphur dioxide instead of formaldehyde for pH control in RT diffusers, injecting the sulphur dioxide partly into the diffusion supply water and partly into the circulation juice system. During the 1967–1968 campaign, factory trials were carried out by the British Sugar Corporation Ltd. using sulphur dioxide gas as an alternative to formaldehyde. One factory operated for one week using only sulphur dioxide then ran for one week using only formaldehyde. Sulphur dioxide was then tested for a further week. Diffuser samples were taken and examined for bacterial activity during these three weeks. The results are reported below.

Diffuser samples were also taken from other factories, not employing sulphur dioxide gas as a bacteriostat, and at which no formaldehyde dosing occurred for one hour before sampling. These diffuser samples were treated in the laboratory with various levels of sulphur dioxide and of formaldehyde before incubation, to determine rates of acid and nitrite formation. The results are also reported below.

Bacteriostats have to be transported by the juice flow to inaccessible parts of the diffuser and therefore, to be effective, they must not be inactivated by reaction with juice components. Such inactivation renders chlorine relatively ineffective[4]. The stability of sulphur dioxide in raw juice was examined together with its fate in carbonatation. The results are reported below.

[1] CARRUTHERS and OLDFIELD: *Paper presented to the 8th Tech. Conf., British Sugar Corporation*, 1955; *I.S.J.*, 1956, **58**, 48.

[2] CARRUTHERS *et al.: Paper presented to the 11th Tech. Conf., British Sugar Corp.*, 1958; *I.S.J.*, 1958, **60**, 335.

[3] *idem ibid.: I.S.J.*, 1958, **60**, 372.

[4] *idem: Paper presented to the 14th Tech. Conf. British Sugar Corporation*, 1961; *I.S.J.*, 1961, **63**, 285.

[5] CARRUTHERS and OLDFIELD: *I.S.J.*, 1964, **66**, 355.

Use of sulphur dioxide in factory diffusion

Sulphur dioxide gas, produced from liquid sulphur dioxide, was injected into both diffusion supply water and circulation juice. The rate of injection into the diffusion supply water was controlled to give pH 5·8; in practice, this worked out at about 100 p.p.m. The injection rate into circulation juice leaving the scalding trough was similar, making a total usage of about 40 lb of sulphur dioxide/100 tons of beet.

The method of injection contrasts with the normal procedure for the introduction of formaldehyde, the majority of which is injected into compartment 16 of the diffuser, so being nearer the main site of infection. At this factory, about 1 lb of 30% formaldehyde/100 tons of beet is also injected into the press water tank. The total usage was about 62 lb of 30% formaldehyde/100 tons of beet.

Since the most obvious result of thermophilic activity is acid production, routine measurements are made in compartments 14 and 15 of the diffuser close to the site where the activity is most apparent. The daily pH averages of diffuser juices and temperatures in the same part of the diffuser, during a period when sulphur dioxide was in use and during a period when formaldehyde was in use are recorded in Table I.

Table I. Daily average pH and temperature of diffuser juices compared with bacteriostat in use

Date	Bacteriostat in use	Diffuser juice pH: Compartment 14	Diffuser juice pH: Compartment 15	Temperature °C
4th Dec. 1967	SO_2	5·35	5·38	72
5th „ „	„	5·31	5·34	74
6th „ „	„	5·36	5·39	72
7th „ „	„	5·32	5·35	73
8th „ „	„	5·43	5·45	73
9th „ „	„	5·60	5·58	73
10th „ „	„	5·34	5·34	72
11th „ „	„	5·35	5·39	72
	Mean	5·38	5·40	73
12th „ „	HCHO	5·60	5·63	72
13th „ „	„	5·47	5·50	73
14th „ „	„	5·30	5·36	72
15th „ „	„	5·43	5·42	73
16th „ „	„	5·46	5·41	72
17th „ „	„	5·43	5·44	72
	Mean	5·45	5·46	72

It is clear that the diffuser pH values were very similar with either sulphur dioxide or formaldehyde in use. Neither bacteriostat had effectively prevented acid production.

The activities of diffuser samples taken from compartments 14 and 15 were also measured by incubating the samples, diluted 1 in 10, in 67% sterile raw juice, following the procedures described earlier[1]. The changes in pH and nitrite formation were measured at intervals during incubation at 65°C for 4 to 5 hours. In order to provide an adequate supply of nitrate nitrogen, 100 p.p.m. was added as sodium nitrate.

The results of the incubation experiments are recorded in Figs. 1 and 2 and show that sterile

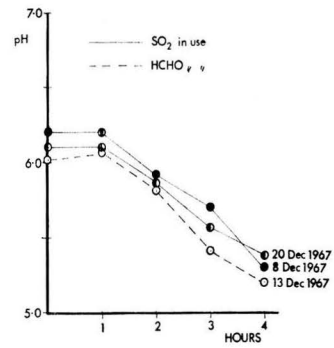


Fig. 1. pH change in incubated diffuser samples

conditions were not achieved with either bacteriostat. The rates of acid formation were almost identical on three sampling dates as can be seen in Fig. 1. The rates of nitrite formation shown in Fig. 2 were measured on only two occasions and the rate appeared to be slightly faster when sulphur dioxide was in use, but this is not considered to be significant.

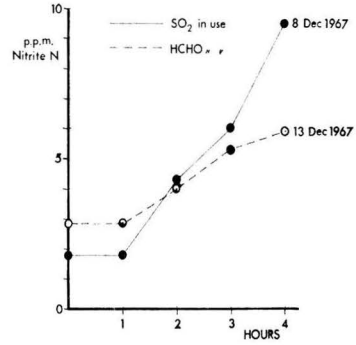


Fig. 2. Change of nitrite in incubated diffuser samples

Raw juice samples taken on the same dates were also incubated. These were less active than the diffuser samples, but produced confirmatory results.

Diffusion supply water samples, taken when either sulphur dioxide or formaldehyde were in use, were found to be inactive in producing acid or nitrite and in previous investigations the supply water has never been found to be a major source of infection[1].

It was concluded that neither formaldehyde nor sulphur dioxide produced sterile conditions in the diffuser at this factory.

In order to obtain more precise comparative data on the effects of each bacteriostat, it was necessary to carry out further laboratory tests.

Laboratory experiments

An early objective was to maintain a culture of thermophilic bacteria, which had been obtained from a factory diffuser, in an active state in the laboratory. By subculturing into laboratory-produced sterile raw juice it was hoped to obtain a culture free from

formaldehyde or other factory additives which might affect the activity measurements.

As the bacteria are inhibited if allowed to remain at around pH 5 for even a few hours, storage without frequent subculturing is difficult. Samples which were stored at 37°, 65° and 78°C overnight were inactive the following morning. Storage at 0·5°C proved partially effective and the results of experiments using this storage technique are reported below.

Experiments with laboratory cultures

Raw juice was sampled from a factory diffuser two hours after formaldehyde dosing had been stopped. 50 ml of this raw juice was added to 450 ml of sterile laboratory-produced raw juice and the mixture incubated at 65°C for 6½ hours. During this time the pH of the mixture dropped from 6·32 to 5·78, indicating moderate thermophilic activity. The mixture was stored for 16 hours at 0·5°C and the pH was found to have dropped further to 5·50.

40-ml aliquots of this culture were mixed with 360-ml aliquots of sterile laboratory raw juice (2 parts diluted with 1 part of water) and the mixtures were treated with two levels of sulphur dioxide, as sodium sulphite, and two levels of formaldehyde. The mixtures were incubated at 65°C and the rates of pH drop, in comparison with a control which contained no added bacteriostat, are recorded in Fig. 3.

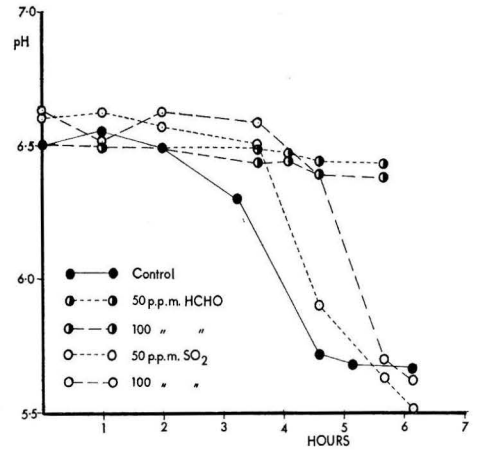


Fig. 3. Effect of sulphur dioxide and formaldehyde on change of pH in incubated laboratory cultures

Neither 50 nor 100 p.p.m. of sulphur dioxide was effective in controlling the pH whereas the same levels of formaldehyde were.

In a further experiment an additional subculturing step was introduced. The purpose of this step was to eliminate as completely as possible formaldehyde or other additives arising from the original diffuser sample. 50 ml of factory raw juice was mixed with 450 ml of laboratory raw juice and kept at 65°C during the day and at 0·5°C overnight. A 50 ml aliquot of the stored culture was then mixed with a further 450 ml of laboratory juice and the complete incubation and storage procedure repeated to produce a 48-hour culture. To investigate whether sulphite was inactivated by contact with raw juice, it was decided in this experiment to mix the sodium sulphite and formaldehyde with sterile laboratory juice for one hour before bringing into contact with the culture. The digests were prepared as follows:—

(*a*) 0·5 ml of 15·75% Na_2SO_3, $7H_2O$ solution, previously adjusted to about pH 6·3, was added to 200 ml of sterile laboratory raw juice and held at room temperature for 1 hour,

(*b*, *c*) 1·0 ml and 2·0 ml of 15·75% Na_2SO_3, $7H_2O$ were mixed with 200-ml aliquots of juice as for (*a*),

(*d*, *e*) 0·5 ml and 1·0 ml of 4% formalin, previously adjusted to about pH 6·3, were mixed with 200-ml aliquots of raw juice as for (*b*) and (*c*), and

(*f*) 200 ml of sterile laboratory raw juice was held for 1 hour at room temperature.

After 1 hour, juices (*a*) to (*f*) were each mixed with a mixture made up of 40 ml of the 48-hr culture and 160 ml sterile raw juice, giving 400-ml digests containing 50, 100 and 200 p.p.m. SO_2 and 50 and 100 p.p.m. HCHO, together with a control. The digests were incubated at 65°C and the observed pH changes are recorded in Fig. 4.

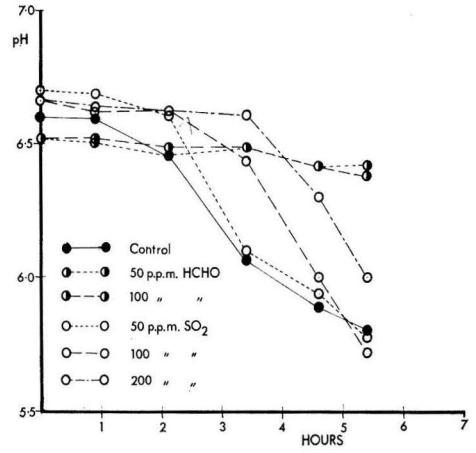


Fig. 4. Effect of sulphur dioxide and formaldehyde on change of pH in laboratory cultures

The overall result of the experiment was very similar to that of the previous experiment. 50 p.p.m. of sulphur dioxide had negligible effect and both 100 p.p.m. and 200 p.p.m. of sulphur dioxide had less effect than 50 p.p.m. of formaldehyde.

Since the activities of these laboratory cultures were slightly less than could be obtained with factory juices, the experimental results were supplemented by carrying out similar experiments with fresh RT diffuser samples.

(*to be continued*)

Solubility of sucrose in water in the range 144-185°C

By JOSÉ FERNÁNDEZ BERTRÁN
(School of Chemistry, Universidad de Oriente, Santiago de Cuba)

THE solubility of sucrose in water has been the subject of numerous investigations. Below 70°C the data available are extremely reliable, but there are minor discrepancies. In the range 70–100°C the results are not as reliable, owing to the following reasons:

(*a*) The solubility at high temperature is so great that the solutions are viscous syrups in which the attainment of equilibrium is a very slow process, usually a matter of days.

(*b*) Sucrose solutions maintained at high temperatures for long periods of time can undergo slight hydrolysis, which affects the solubility of pure sucrose in water.

The range 100–144°C was studied by BENRATH in 1942[1]. Above 144°C and up to the melting point of sucrose, 185°C, we have not been able to trace any experimental data on the solubility of sucrose in water. The solubility of sucrose at 144°C is 94 grams of sucrose in 6 grams of water. The mole fraction of sucrose, however, is only 0·45, owing to the low molecular weight of water in relation to sucrose.

The purpose of this work is to evaluate the reliability of the data at high temperature and to calculate the solubility up to the melting point of sucrose. Both purposes are achieved by means of a thermo-dynamic analysis of the solubility data of BENRATH.

In the sucrose-water system we finda strong interaction between all molecules. This interaction is due primarily to the formation of hydrogen bonds and therefore is of the same magnitude in all cases, sucrose-sucrose, water-water and sucrose-water. At temperatures above 100°C, however, the interaction is considerably weakened by temperature. Because of the above considerations we have made the simplifying assumption that the sucrose-water system can be treated as an ideal solution at high temperature. The validity of this hypothesis is confirmed by the results obtained.

SCHRÖDER[2] developed an equation for the calculation of solubilities of ideal solutions which gives good results over limited ranges of temperatures in which the differential enthalpy of solution at saturation, ΔH, can be considered constant. Applying this equation to a sucrose-water solution at temperatures near the melting point of sucrose, one obtains:

$$-\log_{10} N_s = (\Delta H/2{\cdot}303R) \times (1/T) - (\Delta H/2{\cdot}303RT_0)$$

where N_s is the mole fraction of sucrose at saturation, ΔH is the differential molar heat of solution at saturation, R is the gas constant, T is the absolute temperature of the solution in equilibrium with solid sucrose, and T_0 is the absolute temperature of melting of sucrose.

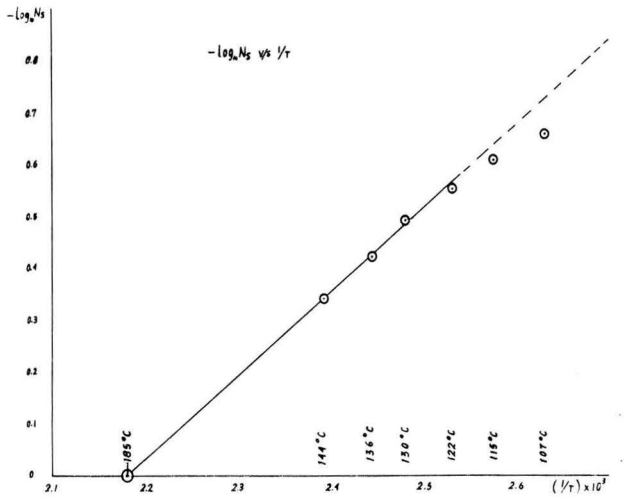


Fig. 1

Table I. Solubility data of sucrose in water in the range above 100°C. Benrath.

— Temperature — (°Centigrade)	(°Absolute)	Grams of sucrose in 100 g of solution	Mole Fraction of sucrose N_s	$-\log_{10}N_s$
107	380·16	84	0·2165	0·6645
115	388·16	86	0·2443	0·6121
122	395·16	88	0·2785	0·5552
130	403·16	90	0·3214	0·4930
136	409·16	92	0·3771	0·4235
144	417·16	94	0·4520	0·3450

The results obtained using this equation on BENRATH's data are given in Table I and Fig. 1. One immediately notices that the points at 130, 136, and 144°C are in a straight line which intersects the temperature axis at 185°C, the melting point of sucrose. Such linearity can only be possible if the following conditions are met:

(*a*) The solubility data of BENRATH and the melting point of sucrose are correct, and

[1] *Z. Anorg. Allg. Chem.*, 1942, **249**, 245.
[2] *Z. Physik. Chem.*, 1893, **11**, 449.

(*b*) the hypothesis of ideal solution and constancy of ΔH is valid in the temperature range 130–185°C.

The deviation from the straight line of the points below 122°C follows the pattern expected to result from a decrease in ΔH with a lowering of temperature.

The calculated ΔH in the 130–185°C range is obtained from the slope of the curve in Fig. 1. Its value is equal to 6·25 kcal/mol. The results obtained in Fig. 1 permit us to calculate the solubility of sucrose in water in the range 144–185°C with a great degree of confidence. They are given in five degree intervals in Table II, but can be obtained for any temperature in the linear range of Fig. 1 and also by the formula:

$$-\log_{10} N_s = 1365\,(273{\cdot}16 + t) - 2{\cdot}979$$

where N_s is the sucrose mole fraction and t the temperature in °C.

Table II. Calculated solubility of sucrose in water in the range 145–185°C

Temperature (°C)	*Grams of sucrose in 100 g of solution*	*Mole fraction of sucrose* N_s
145	94·1	0·458
150	95·2	0·509
155	96·1	0·565
160	96·9	0·625
165	97·7	0·680
170	98·4	0·760
175	99·0	0·840
180	99·5	0·918
185	100·0	1·000

Correspondence

The Editor,

The International Sugar Journal

Dear Sir,

CANE SUGAR EXTRACTION

I am very grateful to Dr. DOUWES DEKKER for his comments on the letter from me which you published in your March issue. I wholeheartedly agree with him that a comparison of overall recovery from a milling plant and a diffusion plant is fraught with difficulties, but I had hoped that a continued discussion might lead to a solution of the problem.

Many experienced technologists have doubted whether all the increased extraction claimed of diffusion plants eventually finds its way into the crystallized sugar. Unfortunately the proponents of diffusion plants have been particularly reticent upon this point, but it is known that they have been considering the implications of it seriously and will, doubtless, eventually be able to surmount some of the fears expressed.

In the August issue of the *I.S.J.* you printed an advertisement from Dorr-Oliver for the Silver Ring Diffusion System, interestingly enough in the same issue of your magazine as Dr. DOUWES DEKKER's letter. The advertisement gives figures covering a four year period at Pioneer factory, showing a very acceptable extraction of around 97·5%, but also indicating a purity of residual juice in bagasse varying from 16 to 20. In contrast to this the 1934 figures at Pioneer showed a marginally higher extraction, 97·7, with a purity of the last expressed juice of 63·68.

Similar discrepancies can be found by careful analysis of figures reported with other diffusion plants of different design, including one case where the residual juice purity worked out at 180%. All this demonstrates that there is yet a considerable amount to be learnt.

Whilst Dr. DOUWES DEKKER's points are valid, as a practical man, at the moment I am concerned with such startling differences in juice purities.

Again, whilst sincerely endorsing Dr. DOUWES DEKKER's plea for laboratory research and believing that, in particular, an intensive investigation into the melassigenic properties of mill juice and diffusion juice would be useful, nevertheless I am often confronted by the down-to-earth, practical question posed by the Boards of operating companies who wish to know: "What are the overall economic benefits to be obtained?" This question must be answered.

Whether or not the final answer can be given immediately, it is, nevertheless, important for the industry to try and use such information as is already available to the best possible advantage and my offer was intended to do just this.

Yours faithfully,

F. A. SEAFORD

Director, Fletcher & Stewart Ltd.

New improved Indian cane variety[1].—A new short-season cane variety yielding 40–50 tons per acre in 10–11 months has been evolved by Bangalore Agricultural University. It is called Habbala Kabbu (I.C. 222) and is recommended for red soils; with proper drainage it can also be grown on black soils. The merit of the new variety over the Co 419 cane grown in many areas of India is its early maturity and high sucrose content.

* * *

Indian beet sugar factory[2].—Because of the recent development of sugar beet cultivation in Rajastan, the Government of that State envisages the construction of a beet sugar factory. A pilot plant, of 25 tons daily capacity, is already in operation.

* *

Power station for Cuba[3].—A power station being built by East German concerns at Central Antonio Guiteras on the north coast of Cuba is intended to supply the factory with sufficient power for a crush of 16,000 t.c.d. It will also supply electricity to Holguín, a town of 91,000 population, Gibara, Puerto Padre and Velasco. The sugar factory, the most important in Oriente Province, will continue production while the work is in progress, no stoppage being considered necessary.

* * *

Iraq sugar factory[4].—The Italian group, Società Generale de Impianti, of Rome is to build a cane sugar factory to come into operation in October 1970. The necessary cane is to be grown in the Amarah province, about 400 km from Baghdad.

[1] *Indian Sugar*, 1968, **17**, 862.
[2] *Agence France-Presse*, 8th June 1968.
[3] *Die Lebensmittelind.*, 1968, **15**, 273.
[4] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (20), 8.

Sugar cane agriculture

Boron deficiency in sugar cane. ANON. *Bulletin, Borax Consolidated Ltd.*, 1968, 22.—Boron deficiency signs in various crops are described or illustrated in colour. In sugar cane the first symptoms appear as small, narrow watery spots which develop parallel to the vascular bundles on the young leaves, resulting in a distinct striping. The lesions soon enlarge and the leaf tissue may later separate to form a fracture, the minor edge of which is serrated. Apical growth is retarded and the young leaves are small, narrow and somewhat chlorotic. Internal brownish streaks frequently develop at and slightly below the growing point.

* * *

Distribution of phosphorus in the sugar growing soils of the Gangetic Series. A. P. GUPTA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 1–5.—In this paper an attempt is made to explain the distribution of different forms of phosphorus in soils of the Gangetic basin where sugar cane is successfully grown. In 3 soil profiles clay contained the highest amount of total as well as organic phosphorus. Total phosphorus increased with depth in immature soils but decreased with maturity of the soil. The seat of accumulation of total phosphorus was around clay particles in all soils.

* * *

Paddy husk for raising sugar cane yields. N. S. SINHA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 7–11.—Experiments at the Sugar Cane Research Station, Shahjahanpur, over a period of several years are described. Paddy husk contains 0·3% N. It was applied, in combination with other minerals, to the green manure crop *Crotalaria juncea* (sanai or sunn hemp) and the subsequent effect on sugar cane observed. Effects on both green manure crop and cane crop were favourable.

* * *

Physiological indices of water deficiency in sugar cane plants and their measurement. S. SINGH. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 13–21. The fundamental principles of assessing drought resistance in sugar cane varieties are discussed.

* * *

Effect of time of planting cane on yield and quality of gur. G. N. MISRA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 23–30.—Experiments during 3 crop seasons at Shahjahanpur are reported. In quality of gur March and April plantings proved worst. It was concluded that, under prevailing conditions, the period from the end of January to the end of February and September to mid-October were the best planting times.

* * *

Leaf nitrogen studies under different manurial and cultural practices in sugar cane. H. P. VERMA and A. ALI. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 31–37.—The effects on N content of spraying certain trace elements on the leaves are discussed. In general the N content was slightly lowered. Mulching with cane trash or paddy husks resulted in higher leaf nitrogen. There was a direct correlation of leaf nitrogen with higher nitrogen application.

* * *

Studies in alluvial soils. B. SINGH and A. N. VERMA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 39–48.—Results are given of a village-to-village soil survey of the Dhampur Sugar Factory Zone, Bijnor, Uttar Pradesh. Morphological characters, mechanical composition, physical and physico-chemical properties and chemical constituents of each group are described and discussed.

* * *

Factors affecting ash content in cane juice. I. Cane varieties. A. P. GUPTA and B. PRASAD. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 49–53. Results are reported of a study of ash content of juice from 5 cane varieties in Northern India. Variation between different varieties was as high as 27·5%. Varieties with high sucrose content absorb more minerals. There was no significant relationship between ash and reducing sugars. Relationship was observed between the accumulation of salts in the cane and atmospheric temperature.

* * *

Trials of organic insecticides against sugar cane termites in Bihar. Z. A. SIDDIQI and M. M. SINHA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 105–110.—Four species of termite are known to occur in Bihar. Five insecticides ("Telodrin", "Heptachlor", "Aldrin", "Chlordane" and BHC) were tested in field trials in sandy and medium soils for two years. All were effective, but from the germination and tillering point of view "Heptachlor" and "Telodrin" were superior to the others. Higher rates of application were needed in sandy soils than in the medium soils.

Potash fertilization of sugar cane. I. Effect of potash application on uptake of nutrients, yield and juice quality. A. P. GUPTA and S. P. SHUKLA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 111–115. Field experiments are reported involving 5 treatments of potash with 5 replications. The potash did not have any effect on yield but increased the purity of the juice significantly in comparison with the control.

* * *

A study of the manurial value of horn meal. M. SHABBIR and P. D. BAJPAI. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 117–123.—Nitrification studies carried out in the laboratory on horn meal are reported. These were made with a view to assessing its value as a nitrogenous manure. Its value as a manure was not affected by the nature of the soil.

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The scale insect (*Melanispis glomerata*), a potential danger to the sugar industry in Uttar Pradesh. K. M. GUPTA, R. A. SINGH, G. SAGAR and S. G. MISRA. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 243–248.—Results are given of a survey of this pest by examining cartloads of cane arriving at the factory. Its presence was revealed, in ratoon crops only, in cane from 269 villages. Loss of sugar due to the pest was greatly increased by delay in harvesting. Growers are to be urged to harvest infected cane as early as possible.

* * *

Frequency of spraying different hormones on the quality and activity of enzymes in sugar cane. V. PANDEY and K. SOOKSATHAN. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 251–257.—Results of trials at Pusa, in which 2,4-D, 2,4,5-T and NAA were sprayed on two varieties of cane (B.O. 14 and Co 419) at a concentration of 100 p.p.m. at different frequencies, are discussed. Quality of juice or extraction percentage was not affected. Hormone treatments increased invertase activity as compared with the control. Less inversion of sucrose to non-extractable sugars was found in cane from plots treated with 2,4-D sodium salt. In general, hormone treatment reduced diastase activity.

* * *

Studies in chlorosis of sugar cane. O. P. NEGI and S. D. ROY. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 265–273.—Observations are recorded on the effects of chlorosis on the sugar cane plant. Chlorotic plants showed a poor development of the root system compared with normal or healthy plants.

* * *

Intercropping with sugar cane. K. KAR. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 325–327. Changing conditions in India and the need for more food crops by intercropping sugar cane during the early stages of growth are discussed. Results of trials with food grains, pulses and onions grown between the cane rows are considered.

* * *

Effect of stalk borer incidence on sugar recovery and on quality and quantity of gur. H. SINGH and B. N. PANDEY. *Proc. 35th Conv. Sugar Tech. Assoc. India*, 1967, (1), 329–332.—It has been observed that the stalk borer, *Chilotraea auricilia*, is more harmful than other borers in that it causes a decrease in the sucrose content of the juice. In this paper deterioration in the quality and quantity of gur is correlated with levels of incidence of the pest. Quantity and quality deteriorate after borer attack exceeds 12·1% of internodes affected.

* * *

Masterbilt release new cane harvester and new cane planter. ANON. *Producers' Rev.*, 1967, **57**, (12), 15–17. The Australian firm of Masterbilt Pty. Ltd. of Bundaberg have introduced two machines of considerable interest to the sugar industry, i.e. the Perry Scott Harvester and H.B.M. Cane Planter. Descriptions of them with photographs are given and their performance described. The Perry Scott is a self-propelled high-capacity single-row chopper harvester with an impressively high output (sixty-eight 2½-ton bins per day). The outstanding features of the cane planter are speed of planting and trouble-free operation. With two men feeding, planting speed is up to 5 m.p.h. and with one man up to 3½ m.p.h.

* * *

Cane cleaners operating in Mulgrave area. ANON. *Australian Sugar J.*, 1967, **59**, 541–543.—Two locally-designed chopped cane cleaners operating by revolving drums and a blast of air to blow away trash are described and illustrated.

* * *

Herbicide investigations: post-emergence trials. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 6–7.—A report is given of 3 trials, in different areas, to test the value of different herbicides in controlling grass weeds during the early growth of cane. The herbicides included: HO 172 at different concentrations; HO 172 at 20 gal + 4 lb "Gesaprin 50 W" per acre; "Ametryne"; "Prometryne"; 70% *iso*-octyl ester 2,4-D every 3 weeks; "Gramoxone"; and "Dalapon". Pre-emergence investigations are also reported.

* * *

Chemical ripening. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 7–8. Results are given of spraying tests with "Sucrol 59 G" at 1 gal per acre in areas where ripening conditions are poor. Cane quality was not improved by the spraying. Sprayed plots tended to give a lower Brix and pol but a higher purity than the unsprayed plots. Reference is made to the fact that timing of harvest after spraying is critical.

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Commercial cane growing project. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 58–62.—Recent investigations have indicated that by more efficient surface irrigation and larger applications of nitrogen fertilizer higher economic yields might be obtained. A project designed to translate these conclusions into commercial practice is described.

Canefly (*Saccharosydne saccharivora*). ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 105–111.—Commercial control in Jamaica cane fields is discussed. Failure to control initial outbreaks is bound to lead to extensive outbreaks and high control costs. Other matters discussed are fecundity, population studies, feeding probes, canefly in British Honduras and natural hosts of canefly in Jamaica. The possible rôle of the British Honduras *Tetrastichus* as a biological control agent is considered.

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Damage by rats (*Rattus rattus* **and** *R. norvegicus*). ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 111.—A new method of assessing rat damage in cane is described. The method involves taking 10 samples, each of 100 canes, from fields of 10 acres. The actual loss of sugar can be derived from the following equation: $y = 0{\cdot}41x + 0{\cdot}10$, where $y = \%$ loss in sugar and $x = \%$ canes attacked by rats.

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The Worthy Park root condition. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 112–116.—Further experiments designed to ascertain the cause of this sugar cane malady in Jamaica are described. It is thought that the root failure condition is most likely caused by a fungus-microarthropod-nematode complex. Further work, particularly with nematodes, is proposed.

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Disease survey. ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 120–121. Results are given of a general survey of sugar cane diseases on some estates in Jamaica, the diseases in question being eye spot, brown stripe, brown spot, red spot, mottled stripe, chlorotic streak, ring spot and pokkah boeng.

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Cane varieties (in Jamaica). ANON. *Ann. Rpt. Research Dept., Sugar Manuf. Assoc. (of Jamaica) Ltd.*, 1966, 121–153.—A detailed account, with much tabular matter, is given of the variety situation in Jamaica. B. 4362 remained the dominant variety and increased in total acreage for all estates. Certain varieties are considered to be on their way out.

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Habana oat grass at Mackay. ANON. *Cane Growers' Quarterly Bull.*, 1968, **31**, 93.—Control methods with this troublesome grass (*Themeda quadrivalvis*) in sugar cane by means of modern herbicides are discussed. Several chemicals gave good results, including "Domatol 66" (a "Fenac"-"Atrazine" mixture) and DCMU ("Karmex") at 4 lb per acre. This grass weed has certain sunlight requirements for seed germination and seedlings may appear at almost any time of year when moisture and sunlight are adequate.

Effect of red rot in Pindar on juice quality. ANON. *Cane Growers' Quarterly Bull.*, 1968, **31**, 79.—It was found that where red rot infection was severe the purity of the juice of the cane variety Pindar was very low. Most of the cane seriously affected by red rot was from the drought stricken areas.

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Some factors affecting water penetration. J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1968, **31**, 86–88. This article refers particularly to the Burdekin district of Queensland, where the furrow system of irrigation is standard practice with cane and where the water penetration problem may be severe owing largely to the fine particle size of many of the soils—silt loams and silts. The problem is due to soil structure and the three main factors adversely affecting it are discussed separately, these being water quality, organic matter content and cultivation techniques.

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Germination failures are expensive. C. L. TOOHEY. *Cane Growers' Quarterly Bull.*, 1968, **31**, 102.—Abnormal weather in southern Queensland prevented normal preparation of land for spring planting. Many growers planted cane in very "cloddy" fields, setts being inadequately covered or else planted too deep, resulting in very poor germination.

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Approved varieties. N. J. KING. *Cane Growers' Quarterly Bull.*, 1968, **31**, 107–108.—A list is given of varieties of sugar cane approved for planting in Australian cane fields for 1968. This is arranged according to some 30 mill areas. A list of approved fodder canes is also given.

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Interrelationships of gibberellic acid and nitrate in sugar production and enzyme activity of sugar cane. A. G. ALEXANDER. *J. Agric.* (Univ. Puerto Rico), 1968, **52**, (1), 19–28.—This paper summarizes greenhouse and laboratory studies aimed at clarifying nitrogen-gibberellic acid relationships in immature sugar cane. The most favourable treatment for growth and sugar production was a combination of low nitrate and medium gibberellic acid.

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Current status of rat control in Hawaiian sugar cane. H. W. HILTON. *Rpts. 1966 Meeting Hawaiian Sugar Tech.*, 47–49.—It is pointed out how rat control measures and their effectiveness vary greatly from one plantation to another. The merits and drawbacks of the various poisons used, notably sodium fluoroacetate, thallium sulphate and the coagulants are pointed out. It is hoped that it will soon be possible to use Bayer 38819 if it proves a good alternative.

Sugar beet agriculture

Relation of weather factors to dispersal of conidia of *Cercospora beticola*. L. W. CARLSON. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14**, 319–323.—This study was made to determine spore disposal of sugar beet leaf spot in the field, in relation to weather, as a basis for devising a disease-forecasting system for disease control. Spore traps were of two kinds, glass rods covered with petroleum-coated polyethylene strips and potted sugar beet plants. Rain proved to be the principal dispersing agent, not wind, which was secondary. Temperatures below 50°F and above 79°F and relative humidity below 60% limited spore dispersal. Where rain is unpredictable it is important to keep to a 10-day spraying schedule for maximum protection.

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Report on spring demonstrations (of beet mechanization) carried out in Belgium. M. MARTENS. *Publ. Bimest. Inst. Belge Amél. Betterave*, 1967, (111T), 51–110.—This comprehensive series of spring demonstrations, carried out at Vieux-Genappe, with many Belgian and oversea delegates present, was very successful. Numerous aspects of spring mechanization, with special emphasis on advances during the last 5 years, were demonstrated. A full account of the demonstrations is given with photographs of plots and equipment used.

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Comparative performance of sugar beet varieties in India. R. R. PANJE and P. S. GILL. *Indian Sugar*, 1967, **17**, 163–172.—Results are reported of trials with about 25 sugar beet varieties between 1960 and 1966 at the Lucknow Institute and some 16 other centres in the country. The overall results showed that the performance of some varieties was good. Production of sugar beet seed was also shown to be possible.

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First record of certain insect pests on sugar beet in the Punjab. O. P. SINGH. *Indian Sugar*, 1967, **17**, 295–296.—Information is given on two insect pests that have been found to attack sugar beet grown experimentally in northern India. These are the cabbage caterpillar (*Pieris brassicae*) and the beet leaf borer (*Lixus aethious*).

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Simplification of spring cultivation of sugar beet in Belgium. M. MARTENS. *Zucker*, 1967, **20**, 588–591. An account is given of the improved techniques that have been adopted in Belgium in connexion with spring cultivation of sugar beet during the last 5 years. Labour shortage has been the important stimulus in the change-over to this greatly increased mechanization. Mechanical singling and drilling to final stand are discussed. During the last 4 years the area on which drilling to final stand has been practised has increased from 600 to 15,000 acres. The author considers it is not possible to predict what further developments may take place in drilling to final stand, as the method has not yet been developed to perfection and certain risks are involved.

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Effect of "Bor-rhe-ka-phos" on sugar beets grown on B-deficient soils. ANON. *International Fertilizer Correspondent*, 1967, **8**, (11), Abs. 1274.—The increasing demand for mixed fertilizers by sugar beet farmers in Germany to save labour and the need to include some boron for boron-deficient beet soils has led to the production of this fertilizer. Many central European sugar beet soils are deficient in boron, and beet is one of those crops with a large boron requirement. Pot and field experiments at Weihenstepha showed that fertilizing with boron Rhenania phosphate prevented boron deficiency symptoms (including heart and dry rot) and gave increased yields.

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Restoring productivity on infested land. C. LUFT. *Sugar J.*, 1967, **30**, (5), 21.—The successful control of nematodes in US sugar beet fields (the beet industry's "creeping catastrophe") by means of soil fumigation is described. In 1967 some 25 growers in the Ft. Lupton-Platteville area applied fumigant to plots varying from 5 to 80 acres, or a total of 520 acres. Fumigation is admitted to be expensive but worth while nevertheless. Cost of fumigant was about $40 per acre or the equivalent of say 2½ tons of beet. However 3 test fields averaged an increase of 14 tons of beet per acre compared with untreated plots. Advice is given on methods of application and precautions advisable.

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Importance of crop rotation. B. TOLMAN. *Sugar J.*, 1967, **30**, (5), 28–31.—The rôle of crop rotation for the sugar beet crop in the United States is discussed and viewed from all angles. Subjects dealt with include: farm lay-outs for rotations, planning rotations, relation of crop rotation to soil fertility, and relation of crop rotation to weed, disease and pest control.

Sugar beet farmers increase yield by fall ploughing. ANON. *Sugar J.*, 1967, **30**, (5), 44.—Figures are given of increased yields obtained from autumn ploughing in several different districts. These varied from less than 1 to 4·9 tons of beets per acre.

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More sugar from the crop. R. DUSH. *Sugar Beet J.*, 1967, **31**, (1), 4–5.—The losses that can and do take place in the harvesting of sugar beet in the United States are discussed. In Ohio a recent study revealed average loss of $14.30 per acre in harvesting. Emphasis is given to correct harvester adjustments. Beets missed by the harvester or broken in the field often amount to a ton per acre. Sugar losses with beater-toppers can also be severe. If topped beets remain in the field up to two days, sugar losses may be 5%, if left 8 days 14% and over 20 days 30%. Hints on reducing these and other field losses are given.

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Opportunities to reduce the wind erosion hazard in sugar beet. L. ROBERTSON. *Sugar Beet J.*, 1967, **31**, (1), 6–7.—Methods of reducing soil erosion through wind in sugar beet fields in the United States are discussed. They include: the use of winter crops where possible, wind breaks (single rows of small grain), crop residues, minimum tillage, planting sugar beet rows north and south and strip cropping methods where the soil is sandy.

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Fall weed control. R. FOGG. *Sugar Beet J.*, 1967, **31**, (1), 8–9.—Attention is drawn to the fact that there are a few weeds that are not controlled, or effectively controlled, by pre-emergence herbicides, such as Canada thistle, perennial sow thistle or yellow daisies and quack grass. Such weeds produce seed in the summer, giving rise to seedlings in the autumn. At this stage they may be effectively controlled by various weedkillers such as 2,4-D, "Dowpon", and "Amitrol T". For waste ground or non-crop areas "Silvex" is recommended.

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The use of herbicides in sugar beet in Ireland. T. J. THOMAS and B. J. MITCHELL. *J. Int. d'Etudes sur le Désherb. Sélect. en Cultures de Betteraves*, 1967, 7 pp.; through *Weed Abs.*, 1967, **16**, 336.—Experiments in Ireland since 1960 have shown that, of the herbicides currently available, "Pyrazon" and "Lenacil" are the most suitable for use with sugar beet (pre-emergence). Certain prevalent weeds, notably *Fumaria officinalis*, have shown some degree of resistance with both insecticides. In Ireland 50% of the total acreage is now treated with "Pyramin".

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Weed control in seed crops of sugar beet. A. E. DEPYRE and F. VERNIE. *J. Int. d'Etudes sur le Désherb. Sélect. en Cultures de Betteraves*, 1967, 12 pp.; through *Weed Abs.*, 1967, **16**, 337.—Experiments in planting up seed nurseries with stecklings (seedlings) showed that the best results were obtained when "Pyrazon" was incorporated in the soil before and not during planting.

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Weed control in sugar beet fields with herbicides applied post-emergence. L. DETROUX and M. MARTENS. *J. Int. d'Etudes sur le Désherb. Sélect. en Cultures de Betteraves*, 1967, 9 pp.; through *Weed Abs.*, 1967, **16**, 337.—Post-emergence trials in Belgium since 1962 have shown that the herbicidal action of "Pyrazon" and "Lenacil" against weeds which have passed the 6-leaf stage is often uncertain and is strongly influenced by climatic conditions. The addition of wetters was an improvement, especially against the weed fat-hen (*Chenopodium album*).

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The use of herbicides in sugar beet. Results from Czechoslovakia. J. FIEDLER. *J. Int. d'Etudes sur le Désherb Sélect. en Cultures de Betteraves*, 1967, 9 pp.; through *Weed Abs.*, 1967, **16**, 338.—Greatly increased use of herbicides in Czechoslovakia (2400 ha in 1963 rising to 8000 ha in 1966) has gone hand in hand with new techniques based on the use of monogerm seed. Time of application is discussed.

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Two years' trials with various herbicides in beet crops in central Italy. F. BONCIARELLI and G. COVARELLI. *J. Int. d'Etudes sur le Désherb. Sélect. en Cultures de Betteraves*, 1967, 14 pp.; through *Weed Abs.*, 1967, **16**, 338.—Among the products examined, the most consistently successful results were obtained with "Pyrazon" and "Lenacil".

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"Topcide", a new post-emergent herbicide for sugar beets. K. P. DUBROVIN, P. W. GULL, H. C. ZEISI and A. J. LATHAM. *Proc. N. Cent. Weed Control Conf.*, 1966, 4; through *Weed Abs.*, 1967, **16**, 339.—"Topcide" (benzamidooxyacetic acid), coded S-6173, is a contact post-emergence herbicide showing particular promise for the control of *Kochia scoparia* in sugar beet in the United States.

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Weed control in sugar beet in south Otago. F. A. MEEKLAH. *Proc. 19th New Zealand Weed Pest Control Conf.*, 1966, 45–54; through *Weed Abs.*, 1967, **16**, 339.—Three different combination treatments, all good, are described, these being "Cycluron" + "Chlorbufam", "Propham" and "Endothal". The varying responses of some of the more troublesome weeds are described.

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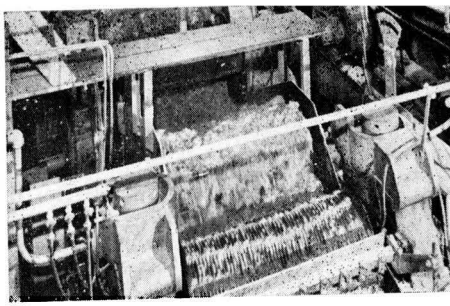
Weed control in sugar beet requires moisture. C. ZIJDEWIND. *Landbouwmechanisatie*, 1967, **18**, 115–117; through *Field Crop Abs.*, 1967, **20**, 325.—Tractor-mounted equipment is described which is used for the simultaneous watering of 12 rows of sugar beet at one time at 1000 litres/ha, to improve crop emergence and the efficiency of chemical weed control in dry weather.

Cane sugar manufacture



Some notes on the operation of vacuum clarifiers. A. E. RABE. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 42–45.—At Umzimkulu mixed juice is heated to 60°C to remove undissolved starch, limed to pH 8·1 (or higher), adjusted to pH 7·4 with monocalcium phosphate solution, and 5 p.p.m. of a coagulant added before vacuum clarifier treatment. The clarified juice is then evaporated after further heating. An alternative scheme has been tested in which the heated mixed juice is limed to pH 8·5, phosphated to pH 8·0, coagulated, clarified, and the clear juice phosphated to pH 7·4, before further heating and further clarification in two Bach clarifiers. Sulphitation is suggested as an alternative to the second clarification.

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Design and performance of an in-line turbidity meter for clarification control. E. J. BUCHANAN. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 46–49. A simple in-line turbidity meter developed and tested by the SMRI is described. Installed at several sugar factories, it has proved reliable for recording the turbidity of clarified juice and has provided useful information on causes of intermittent entrainment. Temperature and feed rate fluctuations have been found to coincide with unsatisfactory clarification, although preliminary tests indicated that juice colour had no significant effect on turbidity.

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Cleaning the outside of evaporator tubes. W. F. DAVIES. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 50–51.—At Felixton sugar factory "Gamlen", a so-called carbon solvent, has proved satisfactory in removing carbon deposits from evaporator, pan and juice heater tubes; at worst only a thin film remained on some tubes, while the deposit was completely removed from the others. The mixture used consisted of two parts of paraffin to one part "Gamlen". Caution in the use of the solvent is emphasized.

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A useful yardstick for volume of C-massecuite. L. T. FOURMOND. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 65–67.—Since calculation of the ratio between the volume of *C*-massecuite boiled and the weight of solids in mixed juice is only of relative value which can easily lead to confusion in comparing the performances of different sugar factories, it is proposed that the volume of *C*-massecuite boiled at 100°Bx be related to the weight of non-sucrose in mixed juice. Guidance is given on correct interpretation of the yardstick.

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Boiling house performance. A. VAN HENGEL. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 56–61.—A "Revised Boiling House Performance" is proposed. It is given by the formula $\frac{(100-c)(1-fD)-u(1-fF)}{0{\cdot}91176}$, where c and u = sucrose lost in filter cake and undetermined sucrose loss, respectively (% sucrose in mixed juice), $f = \frac{P}{100-P}$, where P = final molasses purity, $D = \frac{15-d}{85+d}$, where d = purity increase from mixed to clarified juice, and $F = \frac{100-z}{z}$, where z = undetermined loss "purity". Values of f, F and D are tabulated and a graph presented of mixed juice purity *vs.* final molasses target purity. A worked example is also given.

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Vacuum pan control. Progress Report No. 2. G. N. ALLAN and D. E. WARNE. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*. 1967, 68–78.—The investigations on automatic control of an *A*-massecuite vacuum pan at Gledhow[1] have been continued, and details are given of the tests and findings. The factors examined were temperature control, which was found to be possible to within $\pm$ 2°C, and control of absolute vacuum, calandria steam pressure and syrup feed based on conductivity.

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Relations between centrifugal basket designs and massecuite characteristics. H. EICHHORN. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 79–86. The theory and practice of centrifugal basket design are discussed in relation to massecuite properties and charging. The difficulties of charging tall centrifugal baskets (1000 mm and above) are considered, and details given of a basket, designed by the author's firm (Salzgitter Maschinenbau AG), which has unperforated walls to prevent premature separation of syrup from the crystals and to provide uniform loading, the syrup being discharged through perforations in the bottom and top cover.

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[1] *I.S.J.*, 1967, **69**, 243.

The appraisal of diffusion performance without confusion. E. J. BUCHANAN. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 94–100.—The performances of cane diffusers at Nchalo (Malawi) and at Dalton and Entumeni (Natal) during their first working season are appraised. The Dalton plant includes a BMA diffuser, while the other two are De Smet units. Tabulated data show that the specific efficiencies are the same for all three units, any differences being attributable to 1st mill performance. There is no conclusive evidence to suggest that inversion is greater in diffusion than in milling; nor is there evidence to show that non-sugar extraction is greater in diffusion, it being mentioned that the reverse may be true, particularly regarding starch. It is suggested that diffuser performance be evaluated on the basis of fibre rate and effective area. Mills and diffusers should be appraised on the basis of absolute juice % fibre and not sucrose extraction. Diffusers should be compared between themselves on the basis of residual juice in 1st mill bagasse as well as residual absolute juice % fibre in final bagasse, and hence on the change in the absolute juice:fibre ratio throughout the unit. Diffuser bagasse is possibly more efficiently dewatered by one over-sized mill than by two normal-sized units in series. At high feed rates two units in parallel are suggested.

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The reduction of sucrose losses in clarifiers and milling tandems. J. CROWTHER. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 101–106.—While reducing the temperature and raising the pH of juice in clarifiers was found to reduce the cumulative purity drop during subsequent stoppage, addition of 100 p.p.m. of "Leucosan" quaternary ammonium compound to the juice as well as raising the pH and reducing the temperature reduced the cumulative purity drop to almost negligible proportions (0·2 after 12 hr compared with 4·4 where the juice was heated to 220°F and its pH adjusted to 7·5 before stoppage). "Leucosan" was also found to be effective in reducing sucrose losses and preventing slime formation when applied to the cane mills at Illovo and Mhlume. The optimum quantity and method of application are best determined for each individual factory.

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Experience with automatic boiler controls. A. G. HURTER. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 107–114.—Details are given of the scheme introduced at Umfolozi for electronic control of a 125,000 lb/hr, 450 p.s.i.g. boiler, the furnace of which burns coal and bagasse. Although costing considerably more than a pneumatic system, the electronic system is more versatile and easier to maintain, and has proved highly satisfactory.

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Improvement of heat balance at Umfolozi factory. G. ASHE. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 115–122.—Installation of new heat plant at Umfolozi, where the low cane fibre content (average 13·6%) necessitates high steam raising efficiency, reduced steam usage from 65% in 1965/66 to 55% on cane in 1966/67 despite a 1% drop in cane fibre content. The new plant includes a high-pressure boiler (see preceding abstract), a 6000-kW turbo-alternator, a semi-Kestner pre-evaporator and two juice heaters.

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A plant numbering system in a sugar factory. A. G. HURTER. *Proc. 41st Congr. S. African Sugar Tech. Assoc.*, 1967, 123.—A system is suggested in which each section of a sugar factory is numbered, as are sites in each section. A letter prefix indicates the type of driven unit, while a letter suffix shows the driving components and a numerical suffix indicates ancillary equipment. The system has been applied successfully in other industries. A typical plant inventory sheet is given.

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Detecting sugar losses by entrainment. J. BALSA. *Sugar y Azúcar*, 1967, **62**, (11), 36–37.—The same technique as used at Aguirre to determine entrainment losses[1] was adopted at Central Cortada, where the average sugar loss in a quintuple-effect evaporator was found to be 100 lb/hr. Preventive measures are being considered.

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A calandria vacuum pan for laboratory teaching and research. A. G. KELLER. *Sugar J.*, 1967, **30**, (6), 16–18.—A laboratory vacuum pan used at Audubon sugar factory of Louisiana State University for research and particularly training of pan boilers is described. It has a strike volume of 1·36 cu.ft. and a calandria heating surface area of 2·62 sq.ft.

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Burning of bagasse. A. D. SMITH. *Energy International*, 1967, **4**, (Feb.), 19–23; through *S.I.A.*, 1967, **29**, Abs. 707.—The properties of bagasse which affect its behaviour in combustion are described. The suitability under various factory conditions of refractory furnace cells, inclined grates, and dump, oscillating, travelling or flat water-cooled grates fed by pneumatic spreader stokers is discussed. Excess air requirements, air preheating, and equipment for burning supplementary fuel are briefly considered.

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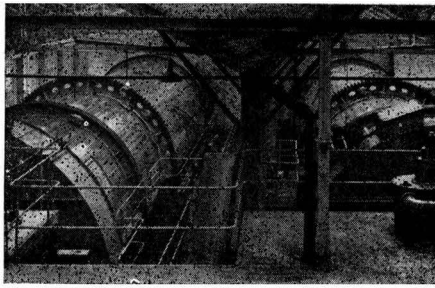
Inversion control with "Biocide" salvages sugar losses. G. A. TRAUTENBERG. *Sugar y Azúcar*, 1967, **62**, (12), 22–23.—Addition of "Biocide 280" (manufactured by Drew Chemical Corp.) to cane juice at the rate of 10–20 p.p.m. has been found to reduce slime formation caused by *Leuconostoc mesenteroides* and inversion. The monetary savings based on actual mill tests are calculated. No residue of "Biocide 280" has been found in sugar or final molasses.

[1] SERBÍA & BALSA: *I.S.J.*, 1966, **68**, 86.

Beet sugar manufacture



Utilization of disc thickeners. P. G. KUSHNIR and S. P. YAROSLAVSKII. *Sakhar. Prom.*, 1967, **41**, (9), 15–16.—Structural defects in Soviet DGS-59 disc filter-thickeners used for 1st carbonatation juice, and in BShU-40 vacuum filters used for 2nd carbonatation juice, are noted. Modifications are described. These and the use of different filter cloths in the vacuum filters led to an improvement in filter station performance at Matusov sugar factory.

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Technological scheme and equipment for removal of impurities from beet. N. M. DATSENKO and V. N. SHCHEGOLEV. *Sakhar. Prom.*, 1967, **41**, (9), 17–22. Details are given of a scheme for handling and cleaning beet during their transfer from the pile to the factory and in the washing section. The merits and demerits of various types and makes of equipment are discussed.

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Effect of mildew on the storage and technological properties of sugar beet. I. V. POPOVA and N. D. BELOVA. *Sakhar. Prom.*, 1967, **41**, (9), 46–47.—The adverse effect of mildew caused by *Erysiphe communis* on beet storage quality and on the quality of raw and 2nd carbonatation juice and syrup, as well as molasses purity and sugar yield, is demonstrated by data comparing mildewed beet with healthy beet.

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The storage of thick juice and its subsequent processing. L. LAMBRECHTS, R. GIBON and A. SIMONART. *Sucr. Belge*, 1967, **87**, 139–147.—Thick juice was stored until March 1966 in three separate tanks at Furnes sugar factory in Belgium. Analysis showed that while storage was satisfactory in the case of filtered juice covered with a layer of paraffin oil and unfiltered juice covered with corn oil, the reducing sugar content rose appreciably in filtered juice covered with palm oil. In all cases the sugar produced from the thick juice was excellent and even better than sugars produced during the campaign. No difference was found between the sugar from the filtered and unfiltered thick juice, the standard liquor being filtered in all cases. Some infection occurred in one tank, but this was attributed to unsatisfactory cleaning of the tank before storage rather than to bacterial growth in the stored juice. A guide is given to requisites for satisfactory juice storage.

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Gas-fired vertical lime kilns. G. VERNOIS. *Zeitsch. Zuckerind.*, 1967, **92**, 586–587.—The advantages of oil or natural gas as fuel instead of coke for lime kilns are discussed and data presented showing the composition and calorific values of various fuel oils, types of gas and natural gases, as well as the maximum theoretical CO_2 content of the last. A brief mention is made of the combustion chamber designed by SCHOPPE which is suitable for oil- and gas-fired kilns.

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Development of the sugar industry and of beet agriculture in the USSR during 50 years of Soviet rule. M. PARSZIKOW. *Gaz. Gukr.*, 1967, **75**, 261–266.—The development of sugar manufacture and beet agriculture in the USSR is surveyed and illustrations given of No. 2 Olymskii sugar factory, one of the latest to start operations.

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Juice purification methods in Danish sugar factories. H. BRÜNICHE-OLSEN. *Gaz. Cukr.*, 1967, **75**, 266–270. The various juice purifications schemes used by DDS over the last 15 years are described, and details given of the DDS filter thickener[1].

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Fundamentals of juice purification at the Yugoslavian Institute at Novy Sad. S. VOLF. *Gaz. Cukr.*, 1968, **70**, 270–276.—Details are given of the carbonatation scheme developed at Novy Sad[2].

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Continuous stone and sand catcher. E. KOWALCZYK. *Gaz. Cukr.*, 1967, **75**, 278–279.—The design and performance of a Polish-designed continuous stone and sand catcher are presented.

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"ARO 700" automatic recycling machine. ANON. *Czechoslovak Heavy Ind.*, 1967, (12), 12–17.—Details are given of the "ARO 700" automatic centrifugal, which is available as a 1000–1200 or as a 1300–1500 r.p.m. machine. Spinning, charging and discharging can be fully automatic, or spinning alone automatic with the other two operations semi-automatic. The full cycle can be repeated by pushbutton, or automatically; in the latter case, each centrifugal in a battery can operate independently, or it can be programme-controlled within the battery. Output is guaranteed at from 5 tons/hr of low-grade massecuite to 16·5 tons/hr of refined sugar massecuite.

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[1] *See* MADSEN: *I.S.J.*, 1968, **70**, 137–140, 176–179.
[2] *See* QUENTIN: *ibid.*, 1965, **67**, 53; 1966, **68**, 243.

Purification of low-grade syrup by defeco-saturation, sulphitation and ion exchange. I. F. ZELIKMAN, D. M. LEIBOVICH and N. M. KODENKO. *Izv. Vuzov, Pishchev. Tekhnol.*, 1967, (5), 122–125.—While defeco-saturation and sulphitation reduced the colour content of syrup of purity in the approximate range 86–92 and of 60°St initial colour by 35–40%, the final colour content was considered still too high. Treatment with anion exchanger after sulphitation, however, increased the total decolorizing efficiency to 70%, even where the initial syrup colour was high (70°St), giving a final colour sufficiently low for sugar of required standard. The optimum specific loading was 2–3/hr, at which 50–65 volumes of syrup were treated by one volume of resin.

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The buffering capacity of products from electrodialysis treatment of green syrup. A. P. KOZYAVKIN, L. D. BOBROVNIK and K. D. ZHURA. *Izv. Vuzov, Pishchev. Tekhnol.*, 1967, (5), 126–128.—In tests on electrodialysis at 20 and 80°C of green syrup of 85·0 and 91·0 purity, the buffering capacity of the dialysate fell with increase in its purity and rose with temperature independently of purity. With heating, the pH of the dialysate fell at a greater rate the greater was the purification effect of the dialysis. The fall was also greater in the dialysate than in green syrup of the same purity.

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Sugar solution retention time in multiple-circulation evaporators. N. YU. TOBILEVICH, O. N. SIRYI and V. T. GARYAZHA. *Izv. Vuzov, Pishchev. Tekhnol.*, 1967, (5), 163–167.—The juice retention time in evaporators was determined by a method involving charging the evaporator with a coloured juice, displacing this gradually with condensate and measuring the colour of the discharged juice electrophotometrically. The retention time was defined as the interval between condensate input and the point at which the Brix of the evaporator contents was zero. Equations are presented for calculation of parameters applicable for generalization of the test results and for evaporator performance analysis with the aim of establishing optimum conditions.

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Application of defeco-saturation at low pH in the standard scheme. A. K. KARTASHOV, V. A. NAGOR- and M. G. KHRISTIANSEN. *Sakhar. Prom.*, 1967, **41**, (10), 31–33.—Comparison of filtration and sedimentation of 1st carbonatation juice obtained by (i) pre- and main liming and 1st carbonatation, and (ii) simultaneous defeco-saturation, pre- and main liming and 1st carbonatation, showed that gassing to pH 9–9·5 (0·020–0·025% CaO) in defeco-saturation, whereby colloid precipitation was increased, helped to make scheme (ii) more efficient than (i). The juice in defeco-saturation was limed at 0·7–0·8% CaO (with 30–40% of the total amount used for juice purification) before gassing. Foam formation was prevented by recycling the gassed juice 5–6 times.

Comparative evaluation of beet washer performance. V. N. SHCHEGOLEV and I. I. PRILUTSKII. *Sakhar. Prom.*, 1967, **41**, (10), 34–38.—In a comparison of various types of Soviet and other beet washers, imported types (BMA, Buckau-Wolf, Duncan Stewart and Fives Lille-Cail) are not recommended because of the absence of high water level sections for removal of light-weight impurities.

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Improving the performance of lime kilns. L. D. SHEVTSOV. *Sakhar. Prom.*, 1967, **41**, (10), 39–43. The effects of limestone size, specific lime production and effective kiln height on kiln performance are discussed and a nomogram presented relating these factors. Another nomogram permits determination of the CO_2 content in the flue gases.

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Design and construction of Kedainyai (sugar) factory. E. KH. BERKOVICH. *Sakhar. Prom.*, 1967, **41**, (10), 50–51.—Information is given on the sugar factory, which has a daily beet slicing capacity of 1500 tons, built at Kedainyai in Lithuania.

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Measuring and control units in the new juice end of Aarberg sugar factory. R. SIEGRIST. *Zucker*, 1967, **20**, 639–641.—The modernized juice end of Aarberg sugar factory is equipped with two central control panels for juice extraction and juice purification, respectively. Information is given on the various measuring and control units. Large-scale indicators (about 8 ft high) are also provided; these show the levels of milk-of-lime and thick juice in the holding tanks, raw juice draught, and 1st filtrate and thin juice flow (the latter to the evaporator station). The controls are operated electro-pneumatically.

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New pole-change squirrel-cage centrifugal drives. H. HINZ. *Zucker*, 1967, **20**, 679–681.—A new 3-phase A.C. pole-change squirrel-cage motor for sugar centrifugals is described. Advantages of the motor include variable speeds for charging and discharging, lower closed-circuit rotor current requirements than with existing motors, low power consumption per cycle, and very small dimensions and weight.

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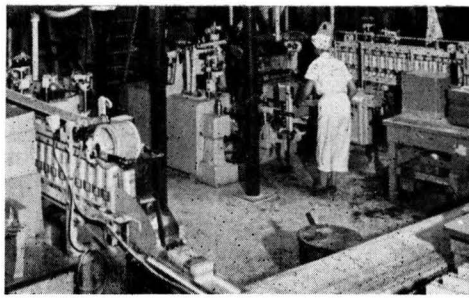
Power production and consumption in a white sugar factory. W. VON PROSKOWETZ. *Zeitsch. Zuckerind.*, 1967, **92**, 623–630.—Electrical power generation and consumption in white sugar factories are discussed, data being tabulated for 36 European factories showing their daily beet slicing capacities and power production and consumption per ton of beet. More detailed information is given on the power usage in seven different sections of four white sugar factories. Particular attention is paid to centrifugal stations, the power consumption of A.C. and D.C. motors being compared.

Sugar refining



Colour elimination in the refineries working with activated vegetable carbon. R. T. PRESAS. *Bol. Ofic. A.T.A.C.*, 1966, **21**, (2), 87–90.—Colour elimination at various stages of raw sugar purification is indicated by percentages found by experience; these indicate that a dark raw sugar of 60–70 colour (on the Horne colour scale) will lose 80–85% of this in affination, while a lighter raw of 20 colour will lose 60–75%. An average value of 8 may be taken for affined sugar. Lime-phosphate treatment will eliminate 10% of this colour, giving a colour of 7·2 which will be reduced to 1·5 in the pan feed liquor. In recrystallization whereby 50% recovery is achieved, colour reduction is 90%, so that a four-boiling scheme will give, from 16 parts of feed liquor solids, 8 first strikes of 0·15 colour, 4 second strikes of 0·27 colour, 2 third strikes of 0·49 colour and 1 fourth strike of 0·87 colour; the average colour of these when mixed will be 0·27. The data are offered as a guide to refinery working so that figures different from the above can be investigated—although they may not be valid as a consequence of different operation and different raws.

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Decolorization of sugar juices with oxidizing agents. B. TICHÁ and J. FRIML. *Listy Cukr.*, 1967, **83**, 30–35. Of various oxidizing agents tested for decolorizing a solution of caramelized colouring matter, calcium hypochlorite proved to be the most effective. Its decolorizing efficiency (expressed in terms of extinction) with both caramelized and nitrogenous colouring matter solution increased to 98–100% with dosage and almost linearly with concentration of colouring matter. It also rose with increase in pH. Treatment of 30°Bx mixed syrup with calcium hypochlorite alone (doses of 0·012–0·1% $CaOCl_2$ at 20°C and 90°C) gave a decolorizing efficiency of 25–29%, while pre-treatment with active carbon raised the efficiency to 32–33%. With raw sugar solutions, the efficiency was only 10%. Pre-treatment with bone char and "Amberlite IRA-401" anion exchange resin followed by $CaOCl_2$ gave lower decolorizing efficiencies than treatment with the hypochlorite alone. In all cases it is recommended to decolorize with $CaOCl_2$ before bone char filtration; active carbon treatment can be before or after $CaOCl_2$ treatment. A $CaOCl_2$-anion exchanger combination for decolorization is not particularly efficient.

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Use of liquid sugar in the food industry. M. RUCIRETA. *Ind. Alimentari*, 1967, **6**, 53–54.—The likelihood of supplying liquid sugars direct from the factories to individual consumers in Italy is discussed with mentioned of the advantages involved—obviation of the need for crystallization, drying, packing, redissolving, filtering, etc.—and a brief account given of the situation in the U.S.A., where a total of 60% of sugar delivered is now in the form of liquid sugar.

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Cooling of white sugar in a fluidized bed. I. B. NOVITSKAYA. *Sakhar. Prom.*, 1967, **41**, (3), 20–23.—A batch cooling unit was used in experiments to determine the relationships between the cooling rate and a number of factors. The white sugar used contained 0·04% moisture. Crystal size was found to have no effect on the cooling rate. The temperature of the cooling air was 15–23°C and the cooling time ranged from 45 to 270 sec. The relationships are given in graph form, and a rather complex formula has been derived for determining the cooling rate and hence cooling time.

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Refining process without decolorizing filtration. L. KOHOUTEK and E. MÜLLER. *Zeitsch. Zuckerind.*, 1967, **92**, 205–206.—Orientation tests in 1964/65 in Czechoslovakia demonstrated the benefits of adding 0·01–0·02% sodium sulphite to *B*- and *C*-massecuites before boiling, the average colour being 70°St/100°S (*B*-massecuite) and 228°St/100°S (*C*-massecuite) with sodium sulphite and 117°St/100°S and 363°St/100°S for *B*- and *C*-massecuite, respectively, without it. The method was adopted during the 1965/66 campaign by two white sugar factories, in which the carbon decolorizing plants were not used. The results confirmed the earlier tests, whereby the colour of the *B*- and *C*-massecuite and of the standard liquors was about one-third lighter, so obviating the need for decolorization plant and lowering the production costs (sodium sulphite costs being about one-quarter of those of "Carboraffin"). The quality of the sugar obtained met the requirements as regards colour type, colour content and ash content.

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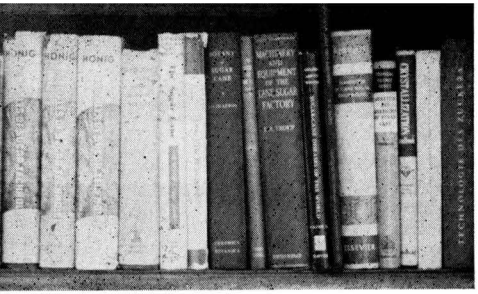
Calculations for a counter-current adsorber with a moving adsorbent bed. YA. O. KRAVETS, A. K. KARTASHOV, YU. D. GOLOVNYAK, M. A. KLEVLEEV and M. V. OSTAPENKO. *Sakhar. Prom.*, 1967, **41**, (5), 17–21.—Experimental data from syrup decolorization using a moving bed of granular active carbon agree with data calculated using a formula relating colour adsorption and bed height. Optimum flow conditions are given for each of three Soviet carbons used and a nomogram is presented for calculation of decolorizing efficiency at given rates.



New books

Barbados. 27 pp.; 6 × 8 in. (Barclays Bank D.C.O., 54 Lombard St., London E.C.3, England.) 1967.

The section concerned with sugar in this well-produced, brief economic survey of Barbados gives interesting information on the production of cane and sugar, fancy and vacuum pan molasses and rum. That there are about 200 cane plantations covering a total of 50,000 acres and 27,000 peasant holdings (under 10 acres) covering in all about 10,000 acres attests to the fact that sugar is the economic mainstay of the island, as it has been for over three centuries.

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Sugar cane factory analytical control. Ed. J. H. PAYNE. 190 pp; 8 × 11½ in. (Elsevier Publishing Co. Ltd., Amsterdam, Holland). 1968. Price: 80s 0d.

The laboratory, analytical and control procedures used in the Hawaiian sugar industry were first assembled in a 6-page pamphlet in 1902. Subsequent editions added considerably to the scope and extent of the text, and the latest edition—the ninth—brings the record up to date. Both the content and form of the book have been completely revised and changes in instrumental methods which have resulted from advancing technology taken into account. Successive chapters provide definitions, describe apparatus, sampling methods and devices, reagents, and analyses, this last chapter of procedures being naturally the largest of this group.

Further chapters deal with boiler water control, extraction and cane calculations, weekly and recovery and losses reports, allocation of sugar and final molasses to fields, and weights and measurements. Commonly used abbreviations are then listed and no less than 50 tables presented with a separate index to them. The final part of the book is a general index.

The precision and clarity of the definitions, apparatus and procedures make this a very useful compilation since they are applicable among many other cane sugar producing countries. While these official methods of the Hawaiian Sugar Technologists are basically in conformity with the methods of the ISSCT, it seems strange that, in a work of this kind, there is no reference to the international body most concerned with procedures and techniques for analytical control, namely ICUMSA.

The Factory Methods Committee in their preface write of their hesitation in forecasting timing of the next edition because rapid developments in instrumentation, automation and computerization point toward obsolescence of the traditional sampling and chemical laboratory approach; with in-line instruments and computer control, the next edition might well be a computer programme, they aver. Whether this does come about or not, however, it is to be hoped that the title of the next edition will revert to inclusion of "cane sugar factory" instead of "sugar cane factory".

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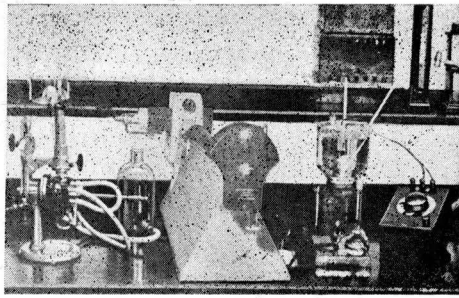
Zucker im Leben der Völker (Sugar in the life of peoples). J. BAXA and G. BRUHNS. 402 pp.; 9 × 11¾ in. (Verlag Dr. Albert Bartens, 1 Berlin 38, Lückhoffstr. 16, Germany.) 1967. Price: DM 98.--; £10 4s 0d.

This beautifully illustrated work is a cultural and economic history of sugar from the earliest records of cane sugar extraction to the latest developments in the beet, cane and refining industries. It covers the various stages in the growth of sugar production and trade, the conflicts between the various colonizing powers of Europe to secure possessions and trade routes for sugar and other commodities, the slave trade as it affected cane growing, and sugar refining in Europe. The beginnings of sugar production in Europe, starting with extraction from acorns, maize and various root crops, to Marggraf's discovery and Achard's experiments in beet sugar extraction, are dealt with in more detail than ever before, to the reviewer's knowledge. The developments of the beet and cane industries in the 19th and 20th centuries are covered in great detail, interspersed with sections on the US and UK industries. Other subjects considered include the International Sugar Agreement, world sugar production, markets and consumption, types of sugar, prices and trade. The etymology of "sugar", and expressions and sayings incorporating "sugar" are also included, as is a section entitled "Der Zucker in der neueren Dichtung" (Sugar in modern poetry). The book contains 210 black-and-white illustrations, made up of miniatures, wood cuttings, paintings, copper and steel engravings, drawings and photographs, drawn from numerous archives, museums, libraries and private collections, many of them not hitherto published. Cartoons by Daumier, Gavarni and others are reproduced as are 12 colour prints and 89 tables. The work is a wonderful record of the sugar industry, and is undoubtedly one that would be an adornment to the bookshelves of many readers. It is certainly one of the finest books published on any subject that the reviewer has seen in recent years.

Laboratory methods & Chemical reports



Investigations of the sieve analysis method. F. G. EIS and J. P. THOMAS. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14**, 283–291.—Investigations with a Tyler "Ro-Tap" shaker, used widely in the U.S. to determine granulated sugar grain size distribution, were carried out to determine sources of error in sieve analysis. The results are discussed in detail and conditions under which accurate analysis can be obtained are specified.

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A simplification of the method for obtaining mean aperture and coefficient of variation of granulated sugars. H. E. HALDEN. *J. Amer. Soc. Sugar Beet Tech.*, 1967, **14**, 297–301.—A straight line plotted on arithmetic probability paper expresses the cumulative particle size distribution[1]. A graph of this type is drawn for U.S. sieve sizes and enables the mean aperture (M.A.) and coefficient of variation (C.V.) to be read directly. Means are provided for correction where non-standard sieves are used.

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The translocation of sucrose in sugar beet crowns in the first year. M. QUILLET, E. BOUGY and V. IMHOFF. *Ind. Alim. Agric.*, 1967, **84**, 999–1003.—From studies on beet fertilized with mineral and organic phosphorus, it was concluded that sucrose is not translocated in the crowns in the form of phosphorylated esters, but is possibly phosphorylated and then dephosphorylated while passing through each xylem membrane. That sucrose exists in free form in the xylem vascular rays was confirmed by the fact that the quantity of organic phosphorus in the crowns was constant irrespective of the time of day at which the beet were lifted.

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Contribution to the study of determination of cane sugar content. M. CAZAL. *Ind. Alim. Agric.*, 1967, **84**, 1007–1010.—Two methods for determining cane sugar content are described. In the first a 5-kg cane sample is crushed by a small shredder followed by cold digestion in a ball mill for 20–30 min. The resultant magma is then pressed and the extracted juice screened before polarization. The method is considered too time-consuming, although use of a "Turmix" instead of a ball mill could, it is suggested, make it more suitable for commercial transactions. The second, more rapid, method involves the use of a hydraulic press to extract the juice from a sample prepared as in the first method. The disadvantages include the use of dearer equipment, and the need for three determinations, including two accurate weighings, while its major advantage lies in the inclusion of fibre in the analysis.

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Moisture determination in different sugar factory products. M. ROCHE. *Ind. Alim. Agric.*, 1967, **84**, 1013–1017.—A survey is presented of methods used to determine the moisture content of various products. The techniques are classified under (i) weight loss determination after drying; (ii) determination of water extracted from the sample; (iii) chemical methods; and (iv) electrical methods.

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Colloidal disperse systems in the sugar industry. II. Determination of colloidal disperse matter in diffusion juice by gel filtration on "Sephadex G-50". R. BRETSCHNEIDER, I. BOHAČENKO and B. KREJČOVÁ. *Listy Cukr.*, 1967, **83**, 198–205.—Raw juice filtered through a 10^4 nm-pore membrane was then fractionated on a column of "Sephadex G-50". As found by CORTIS-JONES[2], the absorption curve had two maxima, the first peak corresponding to macromolecular components, while the second corresponded to the residual, low-molecular, components. Conductivity curves dipped sharply to a minimum corresponding to the second peak in the adsorption curves, where the low-molecular components increased conductivity. The quantity of colloidal disperse matter found by DUMANSKII & KHARIN[3] using alcohol precipitation is 60% greater than the value given by gel and membrane filtration.

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Influence of the decolorization of juices and sugar factory products on the crystallization rate in impure solutions. S. ZAGRODZKI and H. ZAORSKA. *Gaz. Cukr.*, 1967, **75**, (9), 209–214.—See *I.S.J.*, 1965, **67**, 300–303, 337–338.

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Photometric determination of the colour content of sugar factory juices and products. K. WAGNEROWSKI. *Gaz. Cukr.*, 1967, **75**, (9), 214–219.—The fundamentals of photometric measurement of colour content are explained and the various evaluation systems used are described. Types of monochromatic filters in general use are discussed, the Gibson filter, which has good selectivity at 560 nm, being mentioned as a typical

[1] POWERS: *I.S.J.*, 1948, **50**, 149–150.
[2] *I.S.J.*, 1962, **64**, 133–135, 165–167.
[3] "Effect of colloids on processes in sugar manufacture", (Kiev) 1950.

filter for sugar products. The use of salt solutions such as potassium dichromate and copper sulphate as filters is considered, and their transmittancy at varying concentrations compared with that of a Gibson filter at 560 nm. The preparation of filters from such salt solutions and the calculation of a photometer are described.

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The colour content of sugar in ICUMSA units. H. GRUSZECKA. *Gaz. Cukr.*, 1967, **75**, (9), 220–221. White sugar colour content was measured photocolorimetrically and expressed in ICUMSA units and °St. Statistical evaluation of the two sets of values, given in graph and tabular form, has given a relationship of °St = ICUMSA units/104.

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Definition of sugar quality by the RWPG points system. H. GRUSZECKA. *Gaz. Cukr.*, 1967, **75**, (9), 222–224.—Under this East European system points are awarded for type of colour by comparison with standards, colour content determined spectrophotometrically, and conductivity ash content. Average results from the 1966/67 campaign for a number of samples are compared with the colour content expressed in °St and a correlation found, whereby °St = AS, A being a regression coefficient having a mean value of 0·05 and S being the sum of the points from the three tests.

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Evaluation of white sugar quality by the Braunschweig points system. L. KONOPKO. *Gaz. Cukr.*, 1967, **75**, (9), 224–226.—The Braunschweig three-test points system is explained with the aid of tabulated data comparing the values for white and refined sugar under the new three-test system and under the previous four-test system.

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Determination of sugar moisture content using a DDS device. S. NIKIEL. *Gaz. Cukr.*, 1967, **75**, (9), 226–227. See DELAVIER & KRÖCHER: *I.S.J.*, 1966, **68**, 346.

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Determination of trace quantities of arsenic in white sugar. M. GAWRYCH. *Gaz. Cukr.*, 1967, **75**, (9), 227–231.—Of various methods used to determine arsenic in foodstuffs, ashing (i) with nitric acid plus sulphuric acid, and (ii) with hydrogen peroxide has proved suitable for sugar, as has a modification of GUTZEIT'S method, in which a yellow complex is formed between arsenic hydride and mercuric bromide. Tests on Polish white and refined sugars have revealed a maximum arsenic content of 0·08 p.p.m. compared with a permissible upper limit of 1 p.p.m. Most of the samples contained no arsenic.

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Sucrose oxidation with nitric acid. III. Acid isolation. R. BRETSCHNEIDER, Z. ONDRÁČKOVÁ and B. KOPŘIVA. *Listy Cukr.*, 1967, **83**, 227–232.—The solubility of oxalic and tartaric acids in nitric acid of various concentrations at temperatures below 0°C was determined and the results used to establish optimum conditions for the isolation of oxalic acid from the oxidation mixture. Fractional crystallization of the acids by MAKAY'S method[1] did not give tartaric acid of food purity. A more suitable method is fractional crystallization of oxalic acid at —2°C in 20–30% nitric acid followed by precipitation of potassium hydrogen tartarate at room temperature and pH 2·9–3·2.

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Further notes on the rapid decomposition of the molasses under storage in Taiwan. W. CHEN and Z. H. HSU. *Taiwan Sugar*, 1967, **14**, (4), 7–10, 23.—Spectrophotometric analysis of intermediate products formed during decomposition of stored molasses showed their principal constituents to be humic acid, 5-hydroxymethyl furfural, levulinic acid and caramel. Comparison of the absorption spectra for samples from ten sugar factories showed that the spectrophotometric behaviour of the constituents gives a fairly accurate estimation of the decomposition potential of stored molasses.

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Mechanism of sucrose crystal deformation during growth in solution containing non-sugars. S. GAWRYCH. *Gaz. Cukr.*, 1967, **75**, (10), 209–210.—Sucrose crystal deformation is explained in terms of sorption compounds formed by sucrose and non-sugar molecules. Whereas before formation of these compounds non-sugars will retard sucrose crystallization, once affinity occurs between sucrose and non-sugar, the absorbed non-sugar will permit crystallization to continue at the original rate. However, crystal growth will only be on that side not occupied by the non-sugar, so that eventually the non-sugar molecules will leave the sucrose crystal. This molecular displacement corresponds to MANTOVANI'S dynamic sorption and desorption of non-sugars.

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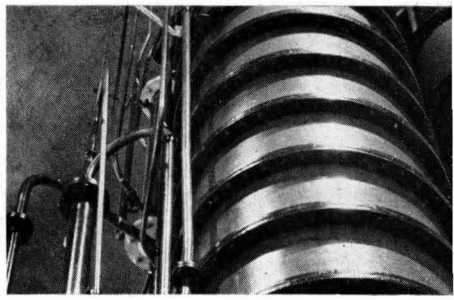
The rôle of reducing matter in sugar production technology. V. P. PALASH and S. Z. IVANOV. *Sakhar. Prom.*, 1967, **41**, (9), 10–13.—Addition of invert sugar to sucrose solution subsequently heated in the presence of sodium or calcium oxide caused the viscosity of the solution to rise, the more so with calcium oxide. Invert sugar alkaline degradation products caused a greater viscosity rise than did invert sugar. Increase in the amount of reducing matter in refinery molasses, to which invert sugar was added before crystallization at 40°C in the presence of excess sucrose, was accompanied by increase in mother liquor Brix and viscosity and in purity expressed as sugars, while the purity expressed as sucrose fell. Addition of invert sugar alkaline degradation products to refinery molasses caused an increase in mother liquor viscosity and displacement of sucrose from the solution.

[1] U.S. Pat. 2,813,121.

By-products



Effect of potassium hexacyanoferrate (II) on the preparation of molasses solutions for citric acid fermentation. IV. Molasses requiring small amounts of hexacyanoferrate. H. LEOPOLD, Z. VALTR and L. ŠIROKÝ. *Nahrung*, 1966, **10**, 345–352; through *J. Sci. Food Agric. Abs.*, 1967, **18**, ii–22.—A sample of molasses behaving normally in the laboratory but requiring only half the normal ferricyanide dose under industrial conditions was studied. At low dose rates a higher proportion of the ferricyanide passes into the precipitate but not as much as in practice. Yields of acid depend on the initial dose rate and can be increased by a further addition on the fourth or fifth day of fermentation.

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The protein industry in Brazil. W. CARNEIRO. *Brasil Açuc.*, 1967, **69**, 396–401.—The production of yeast in Brazil by development on molasses or distillery wastes is briefly discussed and a survey presented of the uses and sources of yeasts, protein needs and supplies for human beings in a number of countries, animal fodder protein supplies and requirements in various regions of Brazil, the cost of protein in various forms (milk, dried fish, etc.), human protein consumption per caput per day before and after World War II and now, protein availability estimates for the future, and installations for protein production in various countries, including Brazil.

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Dextran. J. L. MARIBONA and O. MESA B. *Bol. Ofic. A.T.A.C.*, 1966, **21**, (4, 5, 6), 65–73.—Fermentation of sucrose by *Leuconostoc mesenteroides* and *L. dextranicum* is surveyed, with a note on the economics of dextran production and its uses.

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Profitability of the yeast industry. W. CARNEIRO. *Brasil Açuc.*, 1967, **70**, 16–23.—In Brazil the raw materials used for food yeast production include cane juice, cane molasses and vinasse, giving yields of 60 and 250–280 kg/ton and 0·840 kg/hl of raw material, respectively. The various stages in manufacture of dried yeast are described, and factors influencing profitability are discussed. These include location next to a sugar factory with or without distillery (to give a ready and cheap source of raw material and also steam, power, water, etc.). The various costs in yeast production are tabulated and the investment costs and returns calculated for a 3000 kg/day yeast plant attached to a sugar factory. The cost of food yeast protein is shown to be less than that for protein in meat, milk, eggs and fish, and it is similarly shown to be a cheaper source of vitamin B_2 and amino acids for animals. The market potential in Brazil is studied, as well as the possibility of exporting yeast to the USA.

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Production of ephedrine from molasses. H. OLBRICH. *Licht's Int. Molasses Rpt.*, 1966, **3**, (15), 4, 15, 16; through *S.I.A.*, 1967, **29**, Abs. 480.—Ephedrine (1-phenyl-2-methylamino-propanol) in the pharmaceutically active L-form is produced commercially by a two-stage process. In the first stage benzaldehyde is added to a molasses mash being fermented by baker's yeast, and is converted to phenylacetylcarbinol by a biological reaction (not described, but involving the addition of acetaldehyde). The product is extracted and is reacted with methylamine in the presence of a hydrogen catalyst (second stage). The yield of L-ephedrine hydrochloride is 3·4% on fermentable sugar.

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Fungal protein for food and feeds. IV. Whole sugar beets or beet pulp as a substrate. W. D. GRAY and M. O. ABOU-EL-SEOUD. *Econ. Bot.*, 1966, **20**, 372–376; through *S.I.A.*, 1967, **29**, Abs. 493.—Various species of imperfect fungi were cultivated on media containing sugar beet (140 g/litre) or dried exhausted pulp (50 g/litre) with added NH_4Cl and corn steep liquor. The highest yields of protein (2·54% on beet, 7·6% on dried pulp) were obtained with *Cladosporium* sp. When the pulp medium was supplemented with glucose (10 g/litre), the yield of crude protein increased to 15% with *Cladosporium* sp. and to 16% with *Myrothecium verrucaria*. It is suggested that the pulp medium may be supplemented with molasses.

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Use of by-products of the preserving and sugar industries for producing vitamin B_{12}. M. E. BEKER, U. E. BIESTUR, Z. A. SARMA and R. Ya. EZE. *Produkty Mikrob. Sinteza*, 1966, 117–121; through *S.I.A.*, 1967, **29**, Abs. 494.—Fermentation with thermophilic methane bacteria was carried out in the presence of 2 mg of $COCl_2$/litre. Optimum dry solids content was 4–5% at 58°C and pH 7·2–8. Good results were obtained with beet pulp and apple pulp. The concentration of vitamin B_{12} was 650–840 μg/litre.

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Bagasse paper, Ledesma's ancillary industry. ANON. *La Ind. Azuc.*, 1967, **73**, 191–196.—An illustrated description is given of the processing of bagasse to pulp and four grades of paper at the factory adjacent to Ingenio Ledesma, in Jujuy, Argentina.

Patents

UNITED STATES

Production of sucrose esters of fatty acids. R. ISMAIL, H. CORSEPIUS and H. SIMONIS. **3,347,848.** 7th July 1965; 17th October 1967.—Sucrose is transesterified with a lower alkyl ester of a fatty acid having 12–22 C atoms [and having a weakly hydrophilic group (OH, CO, oxime or alkoxy) in the fatty acid chain] by forming a liquid two-phase system of the alkyl ester in a non-polar aliphatic or aromatic hydrocarbon solvent of b.p. $>100°C$ (toluene, ethylbenzene, gasoline, *cyclo*-hexylbenzene, nonylbenzene or ligroin) and the sucrose and K_2CO_3 catalyst dissolved in a polar solvent (dimethylsulphoxide, dimethylformamide) at 70–90°C, the sucrose and alkyl ester being in a 1:1 molar proportion [while the solvents are in a molar proportion of 0·5:1–5·0:1 (2:1–2·5:1) polar:non-polar]. The two phases are stirred together at 110–180°C while distilling off the lower alkyl alcohol liberated in the reaction, and subsequently the remaining solvents are distilled off.

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Sugar refining by ion exchange. J. F. ZIEVERS, C. W. RILEY and C. J. NOVOTNY, *assrs.* INDUSTRIAL FILTER & PUMP MFG. CO., of Cicero, Ill., U.S.A. **3,351,488.** 8th February 1965; 7th November 1967.—Sugar solution is demineralized by passage through a battery of columns which contain a mixture of cation- and anion-exchange resins. When the contents of one column become exhausted, the contents are transferred with the sugar solution to a regeneration column where the solution is diluted to give a density intermediate between the densities of the anion- and cation-exchange resins. Air is injected into the column, which breaks up the compacted bed and aids separation of the resin mixture into one fraction which floats and a second fraction which sinks. These fractions are collected, sweetened-off, and regenerated separately before returning to storage columns from which appropriate amounts are taken for mixing to give a new demineralization column mixture.

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Cane diffusion. H. A. BRÜNICHE-OLSEN, of Gentofte, Denmark, *assr.* A/S DE DANSKE SUKKERFABRIKKER. **3,355,260.** 28th December 1964; 28th November 1967.

Cane is subjected to lixiviation in a trough from which it is withdrawn as bagasse and passed through a first mill. Fresh water is applied to the milled bagasse and it is then passed through a second mill. The very dilute sweet-water from the second mill is added to the higher end of the trough and the slightly stronger sweet-water from the first mill added at an appropriate intermediate point along the trough. The water flows along the trough in countercurrent to the cane and emerges as an enriched juice at the bottom of the trough.

* * *

UNITED KINGDOM

Simultaneous determination of glucose and fructose. C. F. BOEHRINGER & SOEHNE GMBH, of Mannheim-Waldhof, Germany. **1,095,210.** 2nd August 1966; 13th December 1967.—When determining the temperature dependence of fructose pH by cooling, the solutions have to be left for at least an hour to reach a steady pH; it has been discovered that when the solution temperature is raised, a stable pH is reached within minutes. The principle is used to determine the proportions of glucose and fructose in a solution of these, produced as an eluate on the passage of an invert or sucrose syrup through a cation exchanger, e.g. as described in U.K. Patent 1,085,696[1], whereby the eluate [at a temperature above 20°C (60°C)] is led through as short as possible a piece of polyethylene tubing to a continuously registering polarimeter and thence to a continuously recording refractometer before returning to the bulk of the solution. The refractive index n gives the total concentration c and the polarization indicates the concentrations of glucose c_G and fructose c_F in accordance with equations which have been determined empirically, viz. $n_D^{60} = 1{\cdot}3272 + 1{\cdot}38 \times 10^{-4}c$ and

$$c_G = \frac{-[\alpha_F] \,.\, c + 1000\alpha/x}{[\alpha_G] - [\alpha_F]}$$

and

$$c_F = \frac{[\alpha_G] \,.\, c - 1000\alpha/x}{[\alpha_G] - [\alpha_F]}$$

where α is the angle of rotation and x the length of the polarimeter tube in cm, and $[\alpha_G]_{546}^{60} = 62{\cdot}85 + 3{\cdot}2 \times 10^{-3}c + 2{\cdot}5 \times 10^{-6}c^2$ and $[\alpha_F]_{546}^{60} = -(80{\cdot}4 + 1{\cdot}17 \times 10^{-2}c + 8 \times 10^{-6}c^2)$. The equations and measurements may be used in the form of a nomogram or the polarimeter and refractometer measurements may be obtained in the form of voltage signals which are fed into a computer for determination of the glucose and fructose proportions and the results

[1] *I.S.J.*, 1968, **70**, 157.

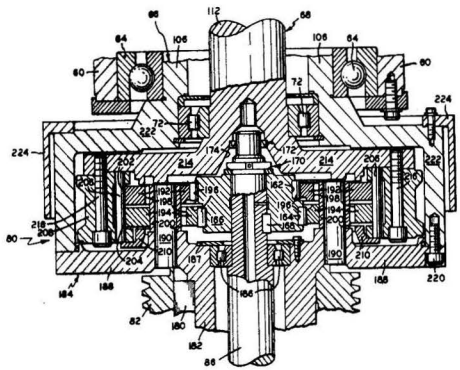
Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent (price 4s 6d. each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 U.S.A. (price 50 cents each).

used to govern automatic control of valves for direction of the eluate streams into the appropriate vessels for recovery of the glucose and fructose.

* * *

Continuous centrifugal. DORR-OLIVER INC., of Stamford, Conn., USA. **1,097,263.** 14th June 1965; 3rd January 1968.

The centrifugal is of the conical type, in which the massecuite is supplied to the upper narrow part of the cone and is separated into mother liquor which passes through the screen and to crystals which are carried downwards to the wider part of the cone by a second internal cone provided with a scroll and rotating at a slightly different speed of rotation. The outer cone is connected to shaft 86 while the inner cone is connected to shaft 112. At the upper end of shaft 86 two eccentric surfaces 162 and 164 are formed on eccentric 166 which is keyed to shaft 86. The eccentric is retained in position by a lock nut assembly 170, and an oil seal assembly 172 is mounted on the extreme upper end of shaft 86 to form a seal between the shaft and inner surfaces 174 of the recessed lower end of inner shaft 112. Pulley 82 is non-rotatably mounted by a key 180 on an annular shaft 182 formed on a lower extension 184 of outer shaft assembly 66.



Shaft 182 is mounted for rotation upon eccentric shaft 86 by upper and lower bearings 186 (lower bearing not shown). Extension 184 of the outer shaft assembly is provided at its upper end with a retainer 187 for bearing 186, and includes a generally disc-like portion 188 integral with shaft 182. Disc-like portion 188 has a plurality of cycloid disc pins 190 fixedly mounted therein. Upper and lower cycloid discs 192 and 194 are mounted for rotation about eccentric surfaces 162 and 164, respectively, by roller bearings 196. Each cycloid disc has circular apertures 198 through it, the number of apertures in each disc being equal to the number of disc pins 190. Pins 190 are each equipped with a bushing 200 which has an outside diameter which is smaller than the inside diameter of the apertures 198 by twice the amount of crank throw of the eccentric surfaces. This clearance permits the cycloid discs and the lower unit 184 of the outer shaft assembly to rotate together about different axes.

At the toothed or cycloid external peripheries 202 and 204 of cycloid discs 192 and 194, respectively, the discs engage cage pins 206 mounted in a cycloid cage 208. A retainer 210 to maintain the cycloid discs in position is secured to cycloid cage 208 by cap screws (not shown). Cage 208 is non-rotatably secured to a lower disc-like, integral portion 214 of inner shaft 112 as by cap screws 216.

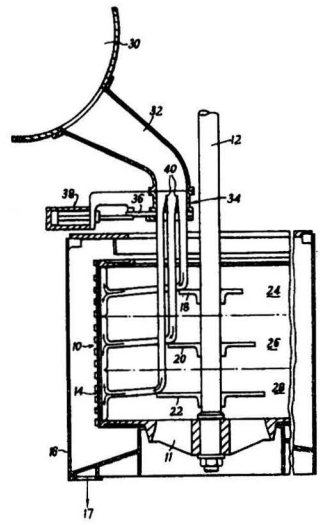
Lower extension 184 of outer shaft assembly 66 is secured by cap screws 220 to a cup-like housing 222 which is formed integrally with outer shaft 106.

In operation, pulley 82 is driven by belt 84 and directly rotates cycloid disc pins 190 as well as the outer shaft assembly which is directly connected to the outer cone. Revolution of disc pins 190 forces cycloid discs 192 and 194 to rotate about the eccentric axis of eccentrics 162 and 164 respectively. The engagement of the teeth on the external periphery of the cycloid discs with cage pins 206 forces cage 208 to rotate at an angular velocity less than that of the outer shaft.

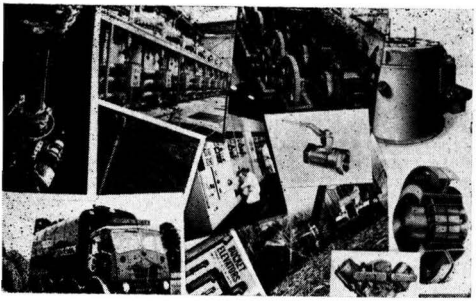
* * *

Centrifugal loading device. SOC. FIVES LILLE-CAIL, of Paris 8e, France. **1,098,682.** 5th May 1966; 10th January 1968.

The central driven shaft 12 of the batch-type centrifugal is provided with three discs 18, 20, 22



roughly in the median planes of zones 24, 26 and 28 within the basket 10. Massecuite is supplied to the centrifugal from container 30 through pipe 32 under the control of shut-off valve 36. Above the level of valve 36 are two wedge-shaped baffles 40 which divide the flow of massecuite into three streams each impinging on a different plate and being directed by centrifugal force onto the inside wall of the basket, so providing even loading and ensuring that less time is required for acceleration of the basket to full speed after the shut-off valve is closed.



Trade notices

Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

Two-row self-propelled beet harvester. Vicon N.V., Nieuw Vennep, Holland; Vicon Agricultural Machinery Ltd., P.O. Box. 10, Ipswich, Suffolk, England.

The Vicon self-propelled two-row beet harvester was demonstrated last autumn at Coddenham, Suffolk, where it operated on an unthinned crop which had been sown to a stand and was otherwise untouched, so that there was a proportion of uneven sized beet. As was to be expected under these conditions, there was some leaf left on the awkward roots, but the harvester was able to lift at the rate of about 1 acre per hour.

The Vicon machine deals with four rows at a time; two rows are topped on the first pass and the topped beet lifted on the second pass while two new rows are topped simultaneously (Fig. 1). The machine

Fig. 1

Fig. 2

can operate with row spacings from 16 to 24 inches. The two topping units, independently-suspended on tension springs, are provided with elevators which carry the tops up to a conveyor across the machine behind the driver (Fig. 2). At the end of this is an adjustable gutter whereby the tops from 6–8 rows may be deposited in a single windrow; alternatively, they may be delivered continuously into a lorry moving alongside the harvester. Behind the topping units, a pair of rapidly rotating rubber flails clean up the beet.

The roots are lifted cleanly and with little damage by the lifting units which consist of a pair of oscillating shears

which can move laterally 4 inches either way, independently of each other, to give them a degree of self-steering. Behind each lifting unit is a short shaker cage which delivers the beet to a two-speed spider wheel cleaner. This in turn delivers them to a conveyor/elevator system which feeds the bunker mounted on top of the machine. Its 3½-ton capacity permits the machine to lift beets from two rows 500–600 yards long without intermediate unloading. The bunker has a hydraulically operated floor so that beet can be shifted across one way to fill it completely or back the other way to unload the bunker when the full-width delivery chute is lowered. In this way it takes only 1–1½ minutes to unload 3½ tons of beet.

The driver controls the entire operation of the machine and is centrally seated so that he has a good view of the topping, lifting and conveying and storage units. He has controls to hand for the hydraulic steering and depth adjustment, a gear lever for the choice of eight speeds between 1½ and 18 m.p.h., and controls for the 73 h.p. Perkins diesel engine. Especially when loaded, the machine is heavy and, to avoid excessive compaction, is provided with 18·4 × 26 rear wheels and 6·00 × 16 front wheels. It is fitted with independent brakes and the hydraulic steering makes it easy to manoeuvre so that it will turn in its own length.

* * *

PUBLICATIONS RECEIVED

TATE & LYLE. Tate & Lyle Enterprises Ltd., Cosmos House, 1 Bromley Common, Bromley, Kent, England.

A well-produced 20-page brochure gives information on the various activities of firms in the Tate & Lyle Group, including Tate & Lyle Enterprises Ltd., which serves to offer advice on subjects ranging from "technical and management problems in raw sugar factories, refineries and associated industries" to "setting up of complete projects". The sugar machinery manufacturing firms in the Group are included, with a list of new factories, current projects and new cane milling tandems and associated plant. A further list is given of refinery projects completed and in hand as well as of feasibility studies. Finally, under by-products handled by the Group are molasses, bagasse board and "Firmcrete" (in which the wood chips usually incorporated in this cement bonded panel used in building are replaced by bagasse).

* * *

Boilers for the British Sugar Corporation.—International Combustion Ltd. have received an order worth nearly £550,000 for three oil-fired, shop-assembled boilers and associated feed water treatment plant to be supplied to the Wissington beet sugar factory of British Sugar Corporation Ltd. Each boiler will have an output of 120,000 lb/hr of steam with a maximum continuous rating of 500 p.s.i.g. and a final steam temperature of 770°F. The boilers will be delivered as complete units and will start operations in October 1970.

* * *

Beet cleaner-loader order.—The Irish Sugar Co. Ltd. has ordered 30 beet cleaner-loaders from Root Harvesters Ltd., of Peterborough, England, with an option to purchase a further 20. The order is worth £10,000.

* * *

Fives Lille-Cail equipment for North Africa.—Soc. Fives Lille-Cail have received an order from S.A. de la Sucrerie des Doukkala for the supply and erection of plant for a new beet sugar factory to be built at Sidi Beanour in Morocco. The factory is due to start operations in May 1970. It will have a daily slice of 2000 metric tons of beet from which it will produce about 30,000 tons of raw sugar per year. Fives Lille-Cail are also erecting a refinery adjacent to the beet factory erected by them at El Khemis in Algeria.

* * *

Buckau-Wolf beet diffusers.—Buckau R. Wolf A.G. are to supply tower diffusers to the beet sugar factories at Uelzen and Düren in West Germany.

* * *

Irrigation equipment for Jamaica.—Farrow & Sons Ltd., of Spalding, Lincs., England, have received an order for overhead spray irrigation equipment worth about £60,000. It is intended to irrigate some 3000 acres of cane fields on estates owned by the United Fruit Co. Ltd. and will include over 27 miles of portable 4- and 5-inch diameter aluminium piping and nearly 1000 sprinklers. The scheme incorporates the new Farrow "Risermatic" system with long-range, single-nozzle sprinklers which can be moved along the sprinkler lines without turning off the water supply. Only one pipe move a day is required.

* * *

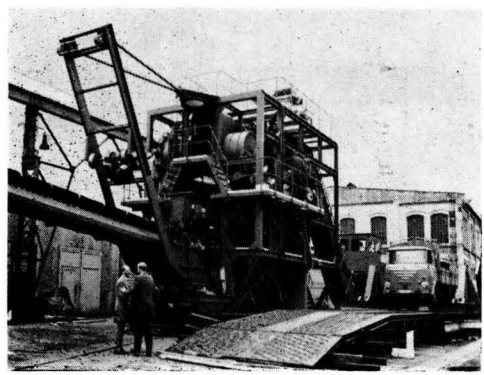
Cane diffusers.—Extraction De Smet S.A., of Antwerp, Belgium, are to supply two TS 45 cane diffusers, each of 4000 tons daily capacity, to the Philippines (bringing the total of De Smet cane diffusers in that country to 6), one TS 45 to Bolivia (also of 4000 tons daily capacity), and one (of 5000 tons daily capacity) to Nicaragua.

* * *

Sugar factory for the Philippines.—The Mirrlees Watson Co. Ltd. has obtained an order from Passi (Iloilo) Sugar Central Inc., of Panay, Philippines, for the supply of a complete raw sugar factory to crush 4000 t.c.d. The contract, worth £7,875,000, also calls for the services of an agricultural team to supervise the development of new land areas for cane growing and developing the existing cane farmers' lands on the island of Panay, as well as certain road and other agricultural work. This supervisory work will be undertaken by Tate & Lyle Enterprises Ltd., an associate company.

* * *

BMA beet unloader-pilers for the USA.—The illustration shows one of eight beet unloader-pilers built by Braunschweigische Maschinenbauanstalt in a period of only 2 months for the Easton beet factory of Maine Sugar Industries Inc. They



are to be put into operation during the 1968/69 beet campaign Each unit weighs 135 tons and measures 48 m long × 14 m wide × 11 m high and is provided with means for separation of stones and dirt from the beet. The separation of stones is of particular importance under Maine conditions, where the soil is very stony. The stones, sometimes bigger than the beets, make it practically impossible with traditional methods to determine the weight of the beets.

US sugar supply quota, 1968[1]

Short tons, raw value	*Quotas as at end July*	*Shortfall Reallocations*	*New Entitlements*
Domestic Beet	3,115,667	—	3,115,667
Mainland Cane	1,186,666	—	1,186,666
Hawaii	1,191,704	—	1,191,704
Puerto Rico	525,000	-10,000	515,000
Virgin Islands	—	—	—
Philippines	1,126,020	—	1,126,020
Argentina	73,520	611	74,131
Australia	201,970	—	201,970
Bolivia	7,113	59	7,172
Brazil	597,641	4,970	602,611
British Honduras	15,392	128	15,520
British West Indies	211,276	1,757	213,033
Colombia	63,240	526	63,766
Costa Rica	70,355	585	70,940
Dominican Republic	682,526	5,676	688,202
Ecuador	86,957	723	87,680
Fiji	44,321	—	44,321
French West Indies	66,463	—	66,463
Guatemala	59,291	493	59,784
Haiti	33,202	276	33,478
Honduras	7,113	59	7,172
India	80,788	—	80,788
Ireland	5,351	—	5,351
Malagasy	9,538	—	9,538
Mauritius	18,513	—	18,513
Mexico	611,078	5,081	616,159
Nicaragua	70,355	-15,520	54,835
Panama	37,810	—	37,810
Peru	476,691	3,964	480,655
Salvador	43,482	362	43,844
South Africa	59,470	—	59,470
Swaziland	7,295	—	7,295
Taiwan	84,154	—	84,154
Thailand	—	—	—
Venezuela	30,038	250	30,288
	10,900,000	—	10,900,000

US mainland cane area reduction.—The US Sugar Beet Association, several regional sugar beet producers' associations, the US Cane Sugar Refiners' Association and associations of sugar cane planters in Hawaii and Puerto Rico have called upon the Secretary of Agriculture to order, by 1970, a reduction of the sugar cane areas in Louisiana and Florida by about 45%[2]. In a common memorandum of the Associations it was stated that the excess sugar supplies in the mainland cane areas have reached such a level as to threaten the very existence of the US sugar programme. On the 20th August the Department of Agriculture announced allotments for cane farms for the 1969 crop which totalled 241,700 acres in Louisiana and 150,840 acres in Florida[3]. For 1967 the total allotments were 302,120 and 188,550 acres, respectively. The Department stated that the 1969 acreage was being reduced—by 20% compared with 1968—to prevent accumulation of sugar stocks over those needed for quota and carryover requirements. It now appears that sugar production from the restricted 1968 crop could exceed the area's calendar year 1968 marketing quota by about 200,000 tons. As a result the effective inventory of sugar on 1st January 1969 would be about 1,265,000 tons, compared with 1,067,000 tons at the beginning of 1968.

* * *

UK sugar surcharge increase.—In view of the fall in the world price of raw sugar on the London Market during the previous weeks, the UK Minister of Agriculture, Fisheries and Food made Orders under the 1956 Sugar Act increasing the surcharge on sugar from 3¾d per lb (35s 0d per cwt) to 4d per lb (37s 4d per cwt) from the 22nd August.

Brevities

The late Silvia Schmidt-Berg.—The death recently occurred, after a serious illness, of Dr. agr. SILVIA SCHMIDT-BERG, née LORENZ. Born in 1929, Dr. SCHMIDT-BERG was well known for her work on sugar microbiology. She gained her doctorate in 1958 for work carried out in the Central Laboratory of Süddeutsche Zucker A.G. From 1960 she had been department head at the Institut für Zuckerindustrie in Berlin and also held a professorship of analytical factory control at the Berlin Technical University. She was a member of the German National Committee of ICUMSA. In addition to her papers on sugar microbiology she had published several papers on other subjects of a cultural-historical vein, for she was also in charge of the Sugar Museum at the Berlin Institute.

* * *

Puerto Rico sugar crop, 1967/68[4].—The crop in Puerto Rico closed finally at 637,288 short tons, 96° basis, which compares with 808,119 tons produced in 1966/67. The Puerto Rican Producers' Association have accordingly advised the US Department of Agriculture and a further deficit has been declared against Puerto Rico's quota. The Department has also been informed that Nicaragua is only able to deliver her basic entitlement and cannot take up deficit reallocations awarded earlier this year amounting to 15,520 short tons. The total of 25,520 tons has been shared among all western hemisphere suppliers except the French West Indies and Panama who are not able to deliver further supplies. Details of the new entitlements appear elsewhere on this page.

* * *

Cuban sugar production 1966/67[5].—According to official data given for the 1966/67 campaign, sugar production amounted to 6,128,914 metric tons, raw value, compared with 4,455,255 tons during the 1965/66 campaign and 6,050,767 tons during the 1964/65 campaign. Total cane crushed amounted to 50,879,802 tons, compared with 36,839,806 tons in the 1965/66 campaign. The harvested cane area amounted to 1,065,500 hectares, from which a yield of about 47·64 tons of cane per hectare was reached. The cane was milled in 152 sugar factories of which 38 had a capacity up to 2100 t.c.d., 76 between this and 4000 tons, 21 between 4000 and 6000 tons, and 17 of more than 6000 tons.

* * *

Colombia by-products utilization[6].—Sucroquímica Colombiana S.A. is a company formed for industrial conversion of sugar by-products; it currently operates an acetic acid plant, an ethyl acetate plant and a citric acid plant. The first has a capacity of 1500 tons/year of which 500 tons/year goes to the second plant for esterification to produce 600 tons/year of ethyl acetate. Most of the remainder of the acetic acid production is sold on the domestic market but some is exported to Venezuela, Ecuador, Peru and Central American countries. The citric acid plant has a current production of 900 tons/year and this is to increase to 2500 tons/year.

* * *

Brazil exports reduction[7].—According to reports from Brazil, production of raw sugar for export is to be reduced to 18 million bags (1,080,000 metric tons) during the current campaign. Total production is, however, to remain unchanged and the production of white sugar for the domestic market will therefore be correspondingly increased.

[1] C. Czarnikow Ltd., *Sugar Review*, 1968, (882), 166.
[2] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (22), 10.
[3] *Lamborn*, 1968, **47**, 135.
[4] C. Czarnikow Ltd., *Sugar Review*, 1968, (882), 165.
[5] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (25), 7.
[6] *Sugar y Azúcar*, 1968, **63**, (7), 20.
[7] *Public Ledger*, 10th August 1968.

Brevities

The late Robert Carolan.—Mr. R. J. CAROLAN, who died recently in Majorca following an accident while on holiday, was born in Dublin in 1906. He joined the Irish Sugar Co. Ltd. in 1930 and became Chief Chemist at the Carlow factory in 1934. He became Chief Research Chemist in 1945. He presented papers on his investigations at a number of international conferences on sugar technology and was the author of several articles which have appeared in this Journal. For a number of years he was an active member of the International Commission for Uniform Methods of Sugar Analysis (ICUMSA). He was respected and well-liked by beet sugar technologists in Europe and elsewhere, and he will be sadly missed by his many friends.

* * *

Iran sugar expansion[1].—Iran plans to construct two new sugar factories and expand five existing ones in an all-out effort to make the country self-sufficient in sugar by 1971/72. The two new factories will go into production by late 1969 with initial daily capacities of 1000 tons each. Beet production in 1969 is expected to rise by 25% against last year while cane sugar production in South Iran is expected to double the 50,000 tons of last year by 1972. Production last year was some 450,000 tons of sugar while consumption reached 600,000 tons, necessitating 150,000 tons of imports. Consumption is likely to go up in coming years owing to rapid population increase.

* * *

Peru drought[2].—Peru is undergoing a severe drought which may reduce this year's crop to as low as 700,000 tons, compared with 730,000 tons in 1967 and 815,000 tons in 1966. The 1969 crop is now estimated at about 675,000 tons. Peru's sugar industry harvests and plants the year round on the rainless coastal desert which is completely irrigated. In the north, however, where some 80% of the sugar is produced, the drought has reduced the run-off from the mountains and water for irrigation is lacking.

* * *

Greek sugar expansion study[3].—The Greek authorities are presently discussing a technical economic study of the agricultural development of Thessaly. The study examines the possibility of the development and establishment of agricultural industrial plants and, among other items, the construction of a sugar factory in the Karditsa area is under consideration.

* * *

Japan sugar refineries merger[4].—The Taito Co. Ltd., with three refineries and one beet sugar factory, Shibaura Sugar Co. Ltd., with one refinery and a beet sugar factory, and Yokohama Sugar Refining Co. Ltd., with one refinery, have merged. The new company will have about 20% of Japanese refining capacity.

* * *

Nigerian sugar imports, 1967[5].—Imports of sugar into Nigeria during 1967 totalled 74,981 long tons, white value, as compared with 62,651 tons in 1966. The UK was the largest supplier with 23,575 tons (24,004 in 1966) while other suppliers were France with 19,825 tons (17,707 in 1966), the USSR with 16,083 tons (5689), Czechoslovakia with 9097 tons (10,259), Poland with 4595 tons (3170). Other countries supplied the remaining 1806 tons (1822 in 1966).

* * *

West Indies Sugar Co. Ltd. 1968 crop.—In an interim report the West Indies Sugar Co. Ltd. has announced that the 1968 crop has been completed with a production of 172,346 tons, compared with 154,614 tons in 1967. In spite of this increase, due to a record crop of 119,032 tons at Frome, the drought in parts of Jamaica has continued during the year and the crop at Monymusk has again been seriously affected. Production there was only 62,314 tons compared with 70,509 tons last year and 80,216 tons in 1966. The Jamaican Government has not yet implemented any of the recommendations of the MORDECAI Commission's report[6]; in particular, it has taken no action on the recommendation for an increase in the local sugar price. This, plus the continuing low world price of sugar, has adversely affected costs and income to such an extent that there is likely to be a loss for the year ending 30th September 1968.

* * *

Upper Volta sugar plans[7].—The Government of the Upper Volta is currently putting into operation a sugar project, representing an investment of 2,500,000 CFA francs, which will involve two phases: production of 15,000 tons of lump sugar per year during 1969 and 1970, using imported sugar, and construction of sugar factories and refineries for the treatment of locally grown cane during 1970–71. After 1971 the country, once self-sufficient in sugar, would become an exporter. The project is to be financed by the Société Industrielle et Agricole du Niari, while the Government of the Upper Volta will participate to the extent of one-third of the investment.

Canada Sugar Imports[8]

	1967	1966	1965
	(*long tons, tel quel*)		
Raw sugar:			
Australia	154,643	103,743	131,682
Barbados	26,182	10,975	18,176
Brazil	—	2,700	5,800
British Honduras	16,426	7,370	5,000
Colombia	6,398	—	5,203
Cuba	68,831	64,338	64,541
Dominican Republic	—	5,000	6,007
Fiji	75,419	41,506	72,961
French West Indies	—	—	3,484
Guyana	87,523	101,132	90,239
India	58,977	50,213	51,980
Jamaica	44,522	96,735	79,364
Leeward Islands	—	7,332	2,832
Mauritius	49,020	84,881	93,346
Mexico	4,500	9,109	—
Rhodesia	—	14,685	28,630
South Africa	266,337	130,115	108,781
Trinidad	16,896	29,666	49,796
Other countries	—	—	54
	875,674	759,500	817,876
Refined sugar:			
Holland	107	80	120
UK	2,690	1,524	1,080
USA	13	7,747	5,540
Other countries	—	27	255
	2,810	9,378	6,995

* * *

Portugal Sugar Imports[9]

	1967	1966
	(*metric tons*)	
Brazil	2,155	18,073
Cuba	—	2,299
Germany, East	107	200
Germany, West	449	306
Holland	50	—
Poland	—	835
Portuguese East Africa	124,374	118,727
Portuguese West Africa	23,875	22,120
Rhodesia	26,585	7,079
St. Thome and Principe	70	—
Other countries	22	117
Total	177,687	169,756

[1] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (20), 7.
[2] *Sugar y Azúcar*, 1968, **63**, (7), 42.
[3] F. O. Licht, *International Sugar Rpt.*, 1968, **100**, (21), 9.
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